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the Petroleum Engineer
FOR MANAGEMENT

JULY 15, 1958
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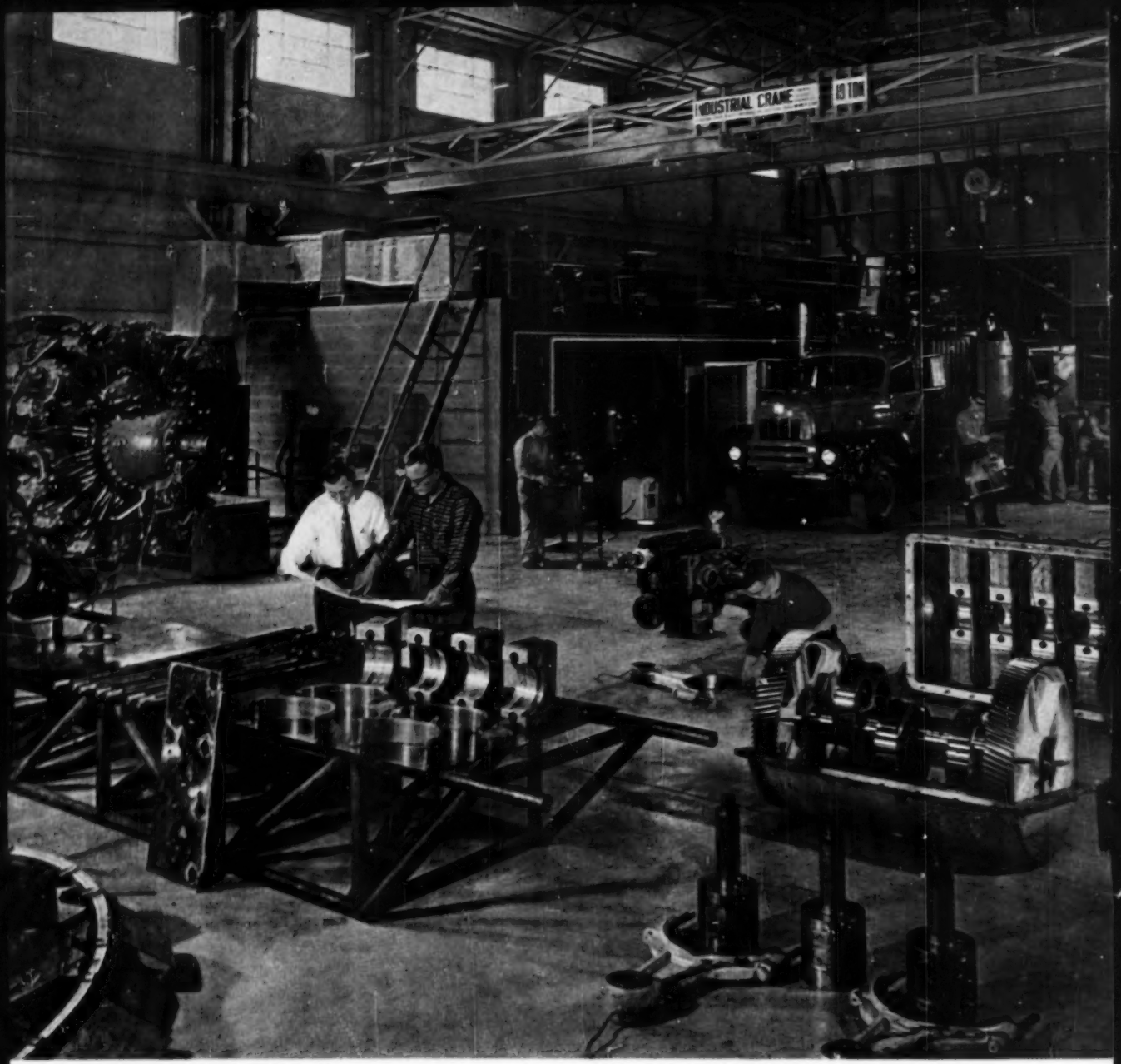
EQUIPMENT REFERENCE ISSUE

thumbnail summaries of important advancements in equipment, services, and products

drilling and producing
THE CHALLENGE IN OIL FIELD MECHANICAL DEVELOPMENT

pipelining
AUTOMATING THE GAS TRANSMISSION SYSTEM

refining
BRIGHT NEW HORIZONS IN PROCESS EQUIPMENT



RESTRICTED AREA! For the Development of Dowell Equipment

The activity you see in this picture is classified . . . confidential. This is the building where Dowell engineers, technicians and research men combine their talents toward the development of new and better equipment. This is the Dowell Mechanical Research and Development Laboratory.

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Their newest ideas are confidential now. These ideas must be fully tested, proved and re-proved before release to the field. When all tests are complete, you have the assurance of knowing that Dowell equipment is *right for the job* and is the *best available*. Dowell, Tulsa 1, Oklahoma.

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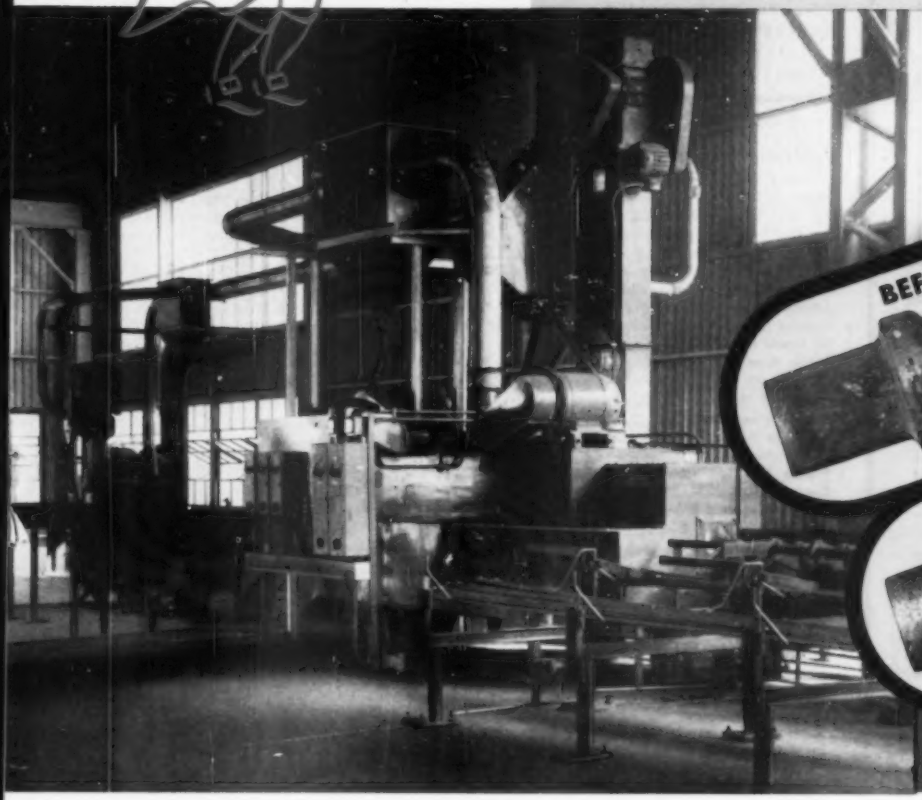
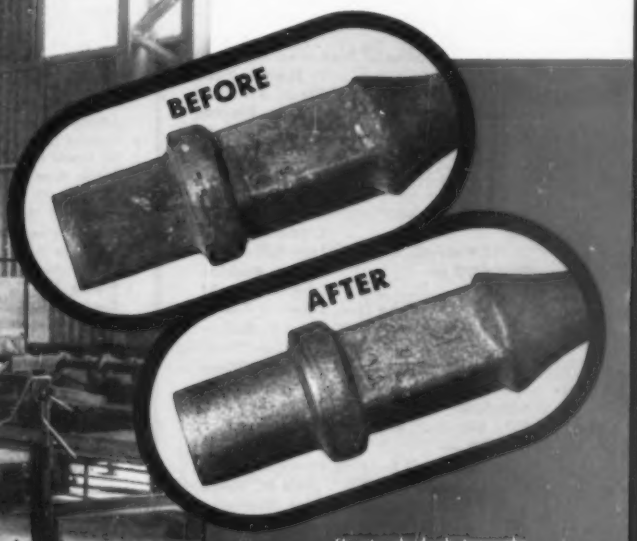


The blunderbuss could get down to bare metal — but it lacked control. Control is a 100% must in Norris' shot blast process.



Unretouched photographs of rod ends before and after shot blasting

. . . in LARGEST, MOST MODERN SUCKER ROD PLANT in the Oil Industry!

In this latest model Wheelabrator machine, automated in controls, the scale caused by heat-treatment is removed by shot-blast, metal to metal abrasive, at high velocity. Inspection then is further aided, as any defects can be detected more readily.

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FOR MANAGEMENT

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— *Ernestine Adams*

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TAKE ADVANTAGE OF ADDED INFORMATION

Items reviewed in this special equipment reference issue are designed to give you the basic information regarding the latest in new equipment, products, and services. Due to space limitations, all available information is not contained in the articles. But handy reader reply cards bound in this issue will bring you all the details direct from the manufacturers.

Simply circle the number corresponding to the new equipment or service item on which you wish more information . . . detach the card . . . and drop it in the mail.

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New Products
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Are You Keeping Up?

The world seems to be turning faster every day . . . with news of space satellites, outerspace travel, more uses of nuclear energy, jet aircraft that travels twice the speed of sound . . . and a host of near-fantastic developments in every technical field. Hardly an edition of the newspapers, the popular magazines and the industrial publications goes to press without accounts of new and important scientific discoveries that someday will touch the lives of everyone.

The pace of technology in petroleum is also advancing at a terrific rate. To check this . . . just compare developments in finding, drilling for, producing, transporting and processing petroleum today with that of pre-World War II days. These new developments — coming thick and fast — affect in a most significant way the success and future of the industry and of its individual segments.

Do you find it hard to keep up with these rapid changes in your own and allied fields? You'd be extraordinary if you didn't. It is one of the harassing problems that your company and our publication (among others) are trying to solve.

You have to know what is going on so what is the simplest, quickest way to assimilate all the necessary information? How can we take in these volumes of varied and vital material without too great stress and strain and without using all our time?

This particular issue of THE PETROLEUM ENGINEER is designed just for that purpose. It contains new developments in equipment, services and products in quick and easy reference form. It will practically jerk you up-to-date with current technical trends in one sitting. It isn't a study in depth — it's a round-up of progress.

After a session with this streamlined picture of today's techniques, you can truthfully say, "I know the latest developments." You have caught up.

J. E. Kastrop

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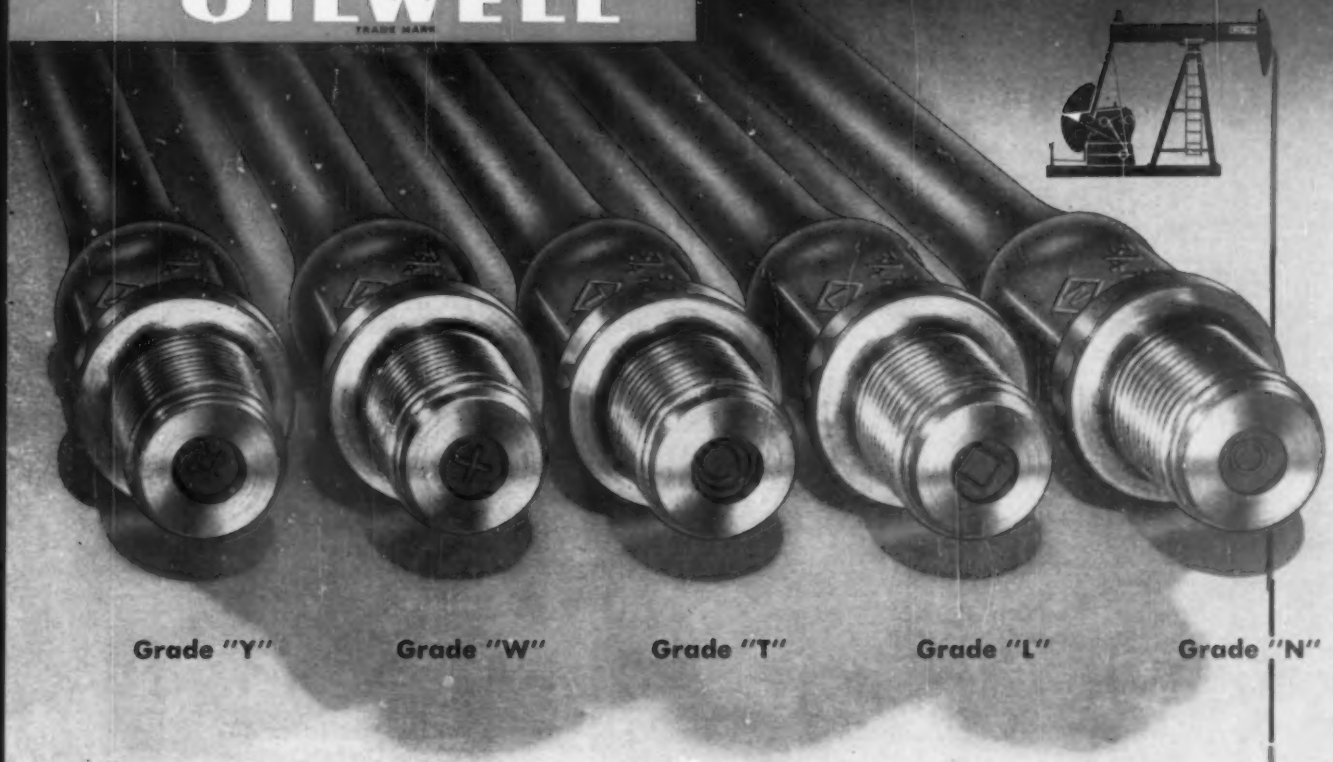
"OILWELL"
TRADE MARK



Try the "Alternate Rod" test!

It will prove that "Oilwell" Sucker Rods last longer.

TO PROVE THE SUPERIORITY of "Oilwell" Sucker Rods, put down a string of rods, alternating an "Oilwell" rod of the recommended grade with the brand of rod you are now using. Time and the elements in your own well will prove that "Oilwell" Sucker Rods give you longer service at lower cost.

There are several *exclusive* manufacturing and metallurgical features that explain the superiority of "Oilwell" rods. Three grades (T, Y and W) are liquid-quenched to make them tougher. These rods are hot-straightened to reduce internal stresses produced by cold-straightening, and they are shot-blasted to compress their surfaces and make them more resistant to fatigue cracks. Careful palletizing protects the rods until they reach the well.

Your nearest "Oilwell" store can supply the sucker rod best suited to your well conditions.

Grade "Y"—Fully quenched and tempered; contains boron; for high loads in non-corrosive wells.

Grade "W"—Fully quenched and tempered; low carbon, high nickel content; for high loads in sour wells.

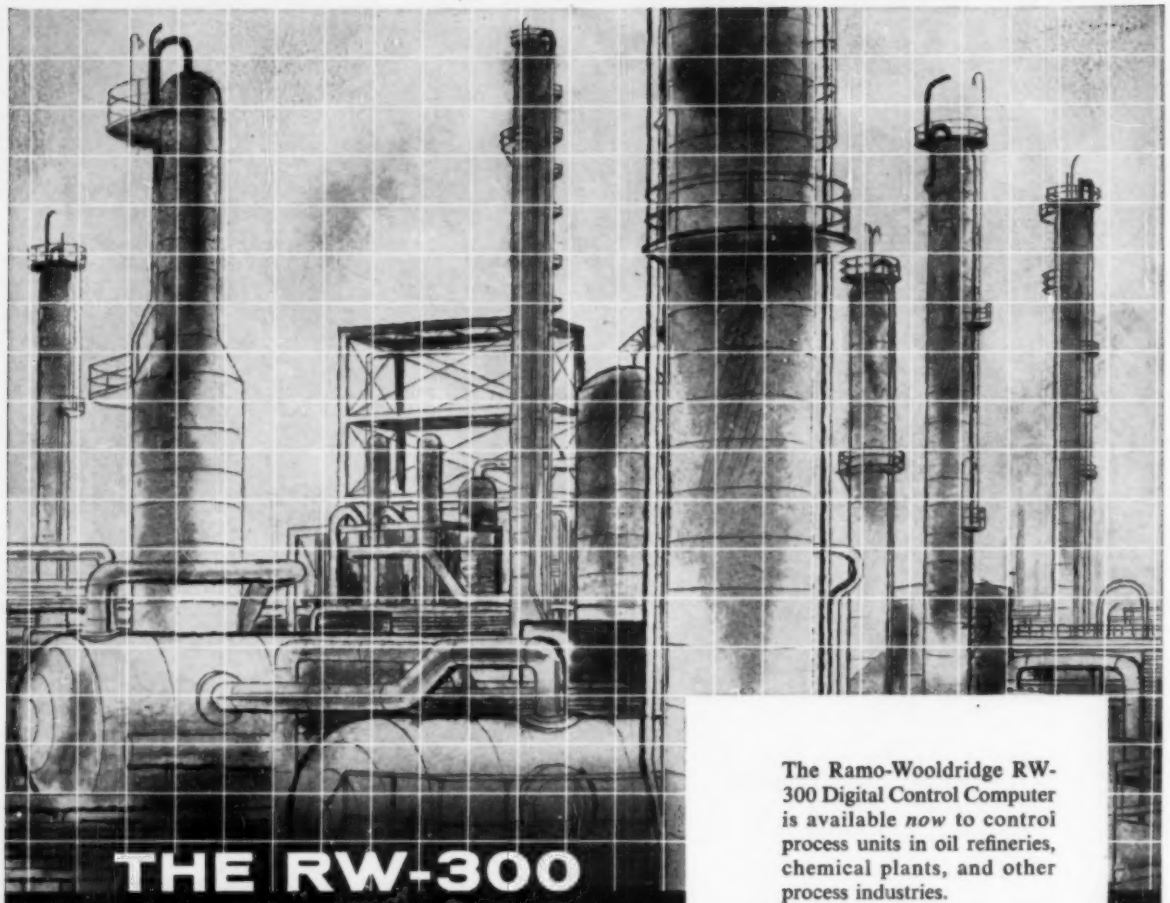
Grade "T"—Fully quenched and tempered; low carbon, high nickel content; for medium loads in sour wells.

Grade "L"—Fully normalized and tempered; special nickel-chromium alloy; for medium depths and sweet corrosion.

Grade "N"—Fully normalized; fine grain, carbon-manganese steel; for non-corrosive wells.

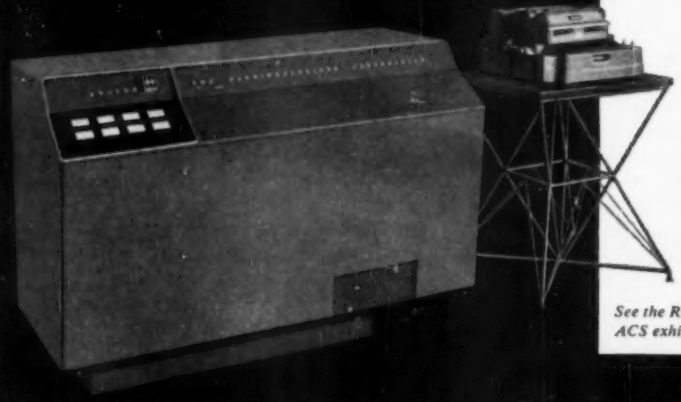
Oil Well Supply Division of USS United States Steel

Branches Serving All Oil Fields **Executive Offices**—Dallas, Texas **Area Offices**—Calgary, Alberta · Casper, Wyoming · Columbus, O. Dallas, Texas · Houston, Texas · Tulsa, Okla. · Los Angeles, Calif. **Export Office**—30 Rockefeller Plaza, New York 20, N. Y.



THE RW-300

is the first digital computer for automatic process control and data logging



The Ramo-Wooldridge RW-300 Digital Control Computer is available *now* to control process units in oil refineries, chemical plants, and other process industries.

The new RW-300 offers outstanding opportunities for higher profits from existing and future plants—through reduced operating costs, increased throughput and yields, and improved product quality. These benefits will pay back an investment in an RW-300 digital control system within six months to two years.

For technical information on automatic process control and advanced data logging with the RW-300, write: Director of Marketing, The Thompson-Ramo-Wooldridge Products Company, P.O. Box 45067, Airport Station, Los Angeles 45, California, or call OSborne 5-4601.

See the RW-300 in operation at the ACS exhibition, April 13-17, San Francisco.

THE THOMPSON-RAMO-WOOLDRIDGE PRODUCTS COMPANY

How you cut costs with the new

TUBE-TURN LIGHT WEIGHT TAPER FACE FLANGES

The new TUBE-TURN* 125 lb. light weight, forged steel, taper face welding neck flanges (patent pending) can cut costs three ways:

1. You eliminate the hazard of breaking cast iron and semi-steel valves, fittings and equipment such as pumps and compressors, caused by overstressing the bolts to get a tight seal when regular ASA steel flanges are used.
2. You avoid the necessity of using more expensive 250 lb. valves with 300 lb. companion flanges.
3. The new flanges cost less, weigh less and take less storage space than the 150 lb. flanges they replace.

Maximum service pressures are the same as for Class 125 cast iron flanges in ASA B16.1, namely: 125 psi (gage) saturated steam; 175 psi (gage) liquid and gas (WOG) at 150°F.

Here is another example of the cost-saving advantages you realize when you specify TUBE-TURN products and buy them from your nearby Tube Turns' Distributor.

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

LOUISVILLE 1, KENTUCKY

tt TUBE-TURN

* "TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

For more details, turn the page

The trademarks "TUBE-TURN" and "tt" are applicable only to the quality products of Tube Turns.

How TUBE-TURN®

Taper Face Flanges give you a

tighter seal

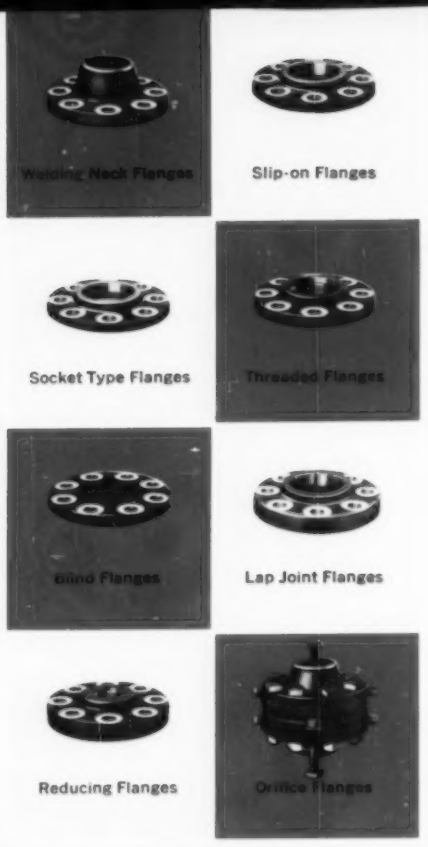
without overstressing

TUBE-TURN taper face forged steel welding neck flanges conform to the 150 lb. American Standard with respect to flange diameter and drilling, but both the flange ring and tapered hub are thinned to make them compatible in strength and stiffness to Class 125 American Standard cast iron flanges with which they are mated.

In addition, the flange face has a 1½° convex taper which concentrates gasket contact pressure near the bore, reducing the required sealing force. As the bolts are tightened—but long before the bolt moment becomes excessive—the flexible steel flange is deflected toward the cast iron flange to the extent that contact is established over the entire gasket face.

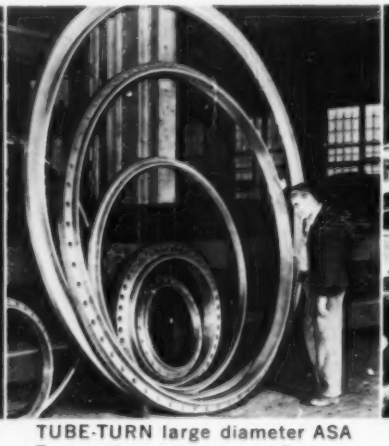
Thus, these features combine two important advantages: (1) A lower sealing force associated with minimum width ring gaskets, located at the bore; and (2) assurance against over-tightening which is characteristic of full face gaskets.

*"TUBE-TURN" and "⁂" Reg. U. S. Pat. Off.



There is a complete line of TUBE-TURN Flanges.

Using TUBE-TURN Taper Face Flange on gas distribution line.



TUBE-TURN large diameter ASA Type and pressure vessel flanges.

Your nearby Tube Turns' Distributor provides a complete line of TUBE-TURN Flanges. This one source for all your needs in welding fittings and flanges (more than 12,000 items) enables you to put all your requirements on one order . . . to cut red tape and save purchasing time.

MAIL FOR WALL CHART New flange matching chart simplifies stocking and procurement. Enables quick selection of correct TUBE-TURN flanges for use with semi-steel lubricated plug valves.

TUBE TURNS
224 East Broadway, Louisville 1, Kentucky

Please send free Flange Matching Chart.

Company Name _____

Company Address _____

Your Name _____

Position _____

City _____ *Zone* ____ *State* _____

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY
LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Detroit • Atlanta • New Orleans • Houston • Midland • Dallas • Tulsa • Kansas City • Denver • Los Angeles • San Francisco • Seattle. **IN CANADA:** Tube Turns of Canada Ltd., Ridgetown, Ontario • Toronto, Ontario • Edmonton, Alberta • Montreal, Quebec • Vancouver, British Columbia.

How much will it lift?

With this Koehring 405 crane, you're equipped to lift any load up to 20 tons. That's based on conservative 75% rating. Boom lengths range from 40 to 90 feet. Butt-connected boom is safe, solid. Inserts are easily changed. When extra reach is needed, 15 to 30-foot jib can be added to 80-foot boom. This gives you a maximum boom and jib of 110 feet.

Lift capacity is work capacity

Power, strength and load stability as a crane increase the 405's *work capacity* with every attachment. It handles 1 to 1½-yard clamshell or dragline buckets on a wide work radius — readily converts to heavy-duty 1-yard shovel or hoe.

When it comes to operating ease, the 405 is in a class by itself! Has self-adjusting power ciutch, light lever-pull, sensitive "feel" of load, automatic crawler traction brakes, only 2 main shafts in upper machinery, and many other advantages which simplify operation, reduce maintenance, and help you get more work done. Let your Koehring distributor show you what the 405 will do for you. Better call him *today*.

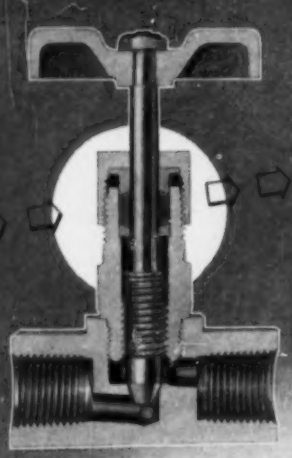
45-TON "ROUSTABOUT" — Installing heavy machinery in the oil field, the new Koehring 545 truck crane shows off its muscles. Heaviest lift was a 23-ton mud pump — an easy lift for the husky 545. It can pick up 45 tons with 40-foot boom at 15-foot radius. On high lifts it handles maximum 120-ft boom, plus 30-ft jib.

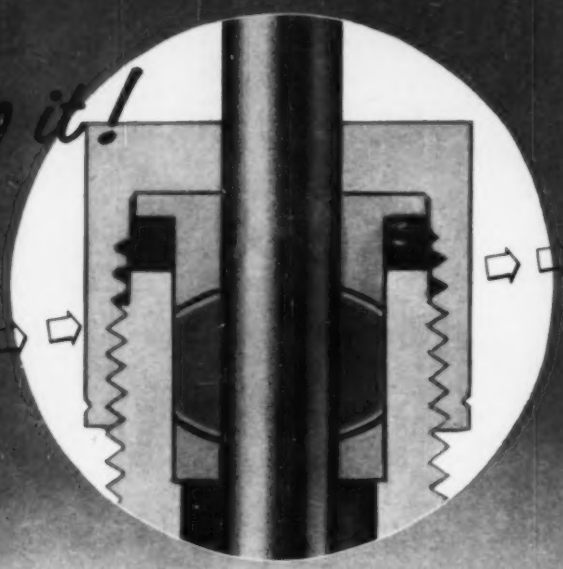
KOEHRING
DIVISION OF KOEHRING CO.
Milwaukee, Wisconsin

K7001

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

Marsh has it!





The Marpak Packing System

—*now with fabulous*

"TEFLON" PACKING

An outstanding feature of the Marsh Needle Valve has been the Marpak Packing System. This unique method of obtaining a tight, but non-binding seal is one of the important reasons for the ability of Marsh Valves to give precision regulation at any pressure up to 10,000 psi.

Now the Marpak system has been made still better by the use of today's miracle material—"Teflon." You probably know of the almost incredible toughness, resilience and non-adhesive properties of Teflon—properties that are unimpaired by the most powerful of solvents, acids, or alkalies, even at temperatures up to 500° F.! As a result of incorporating "Teflon" packing, Marsh Stainless Steel Needle Valves are now

Guaranteed for any pressure up to 10,000 psi at any temperature up to 500° F.

In other makes of valves permissable temperature *decreases* as pressure *increases*—but not with Marsh.

Teflon packing is one more addition to the list of features that are combined only in Marsh Stainless Steel Needle Throttling Valves. Note the list opposite...ask for bulletin.

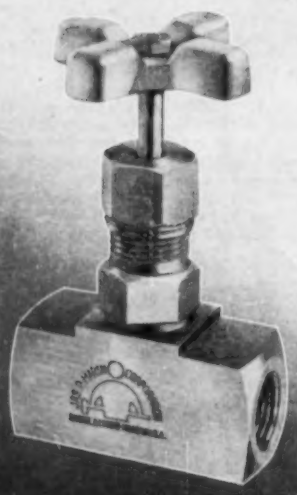
Available in

MARSH

416 Stainless Steel

Needle Throttling Valves

- **Body and stem guide machined from bar stainless steel stock**
- **Valve Stem hardened stainless**
- **Fine stem threads for extra strength and precision throttling**
- **Deeper inlet and outlet chambers**
- **Bodies made in accordance with MSS regulations**
- **Packing "Marpak" system incorporating "Teflon" as described opposite**



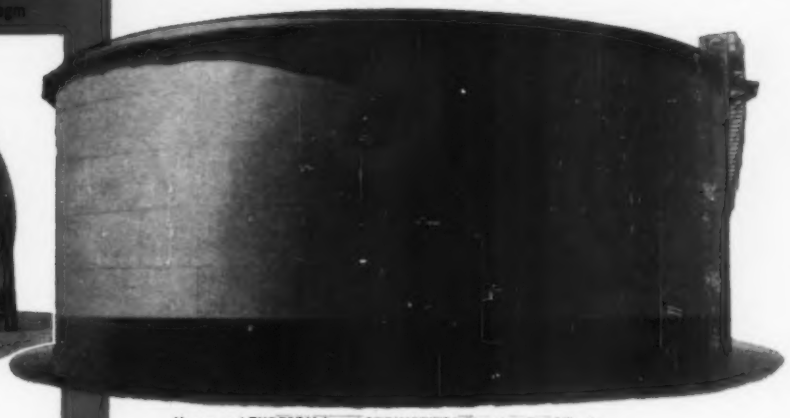
MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corp.*, **Dept. M Skokie, Ill.**
Marsh Instrument and Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Texas

HAMMOND

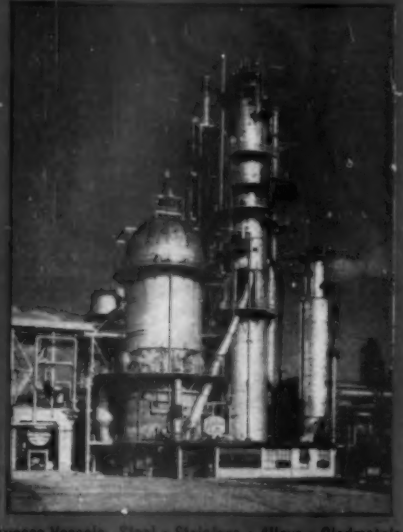
STORAGE TANKS and PLATE FABRICATION

"HALIFT" Tank with vapor-saver diaphragm

Hammond Sphere

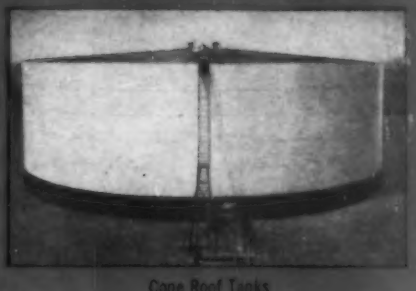


Hammond **TUBESEAL*** and **SPRINGTITE*** Floating Roof Tanks



Process Vessels—Steel • Stainless • Alloys • Cladmetals

Water Storage Tanks



Cone Roof Tanks

The universal acceptance of Hammond-built equipment is the result of more than half a century of experience in the design, fabrication and erection of storage tanks, process vessels and steel plate construction for the petroleum, chemical and allied industries, and for water supply.

HAMMOND IRON WORKS

WARREN and BRISTOL, PA. • PROVO, UTAH • CASPER, WYO. • BIRMINGHAM, ALA.

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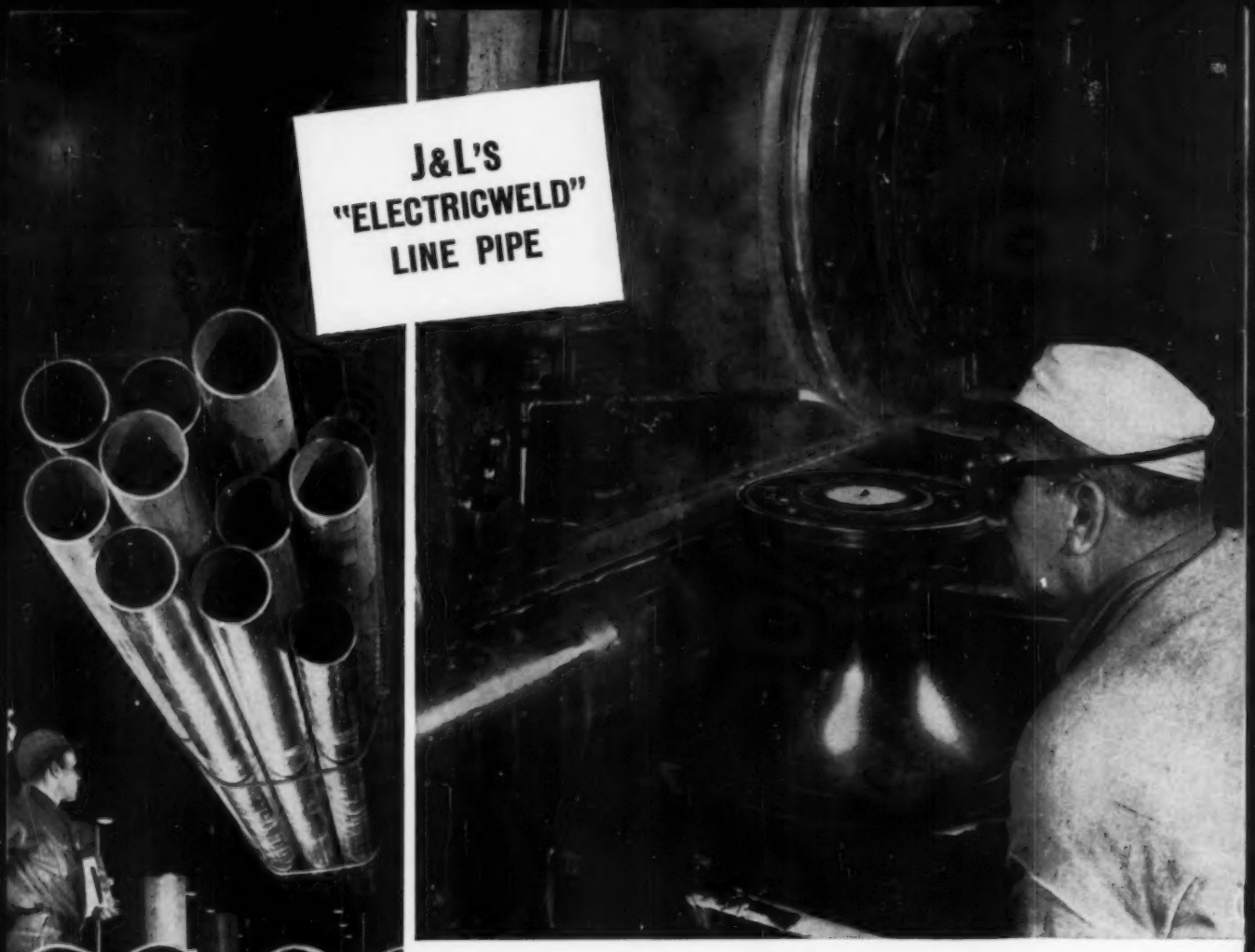
*patented

HAMONDTANK



"EVERY LENGTH QUADRUPLE-TESTED FOR UTMOST DEPENDABILITY"

Rigid quality control has top priority in production of J&L's Electricweld pipe for gathering, distribution and transmission lines.

Every length is pressure-tested under the specified A.P.I. or A.S.T.M. hydrostatic test requirement both in time and in degree of pressure. Lengths to 60 feet speed installation, reduce number of field welds.

Electricweld pipe is available from 6⅝ inches through 12¾ inches O.D. Electricweld line pipe is manufactured to appropriate A.P.I. and A.S.T.M. specifications.

In addition to **visual inspections,** each length of pipe is given a **crush test,** to determine weld strength and quality of steel. It is subjected to a pressure test on one of the largest and most modern **hydrostatic testers** in the world. As an additional precaution and assurance to the customer, Jones & Laughlin is giving both ends of each joint a **magnaflux examination.**

Get complete information on Electricweld line pipe from your J&L distributor or write direct to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pa.

J&L STEEL

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

Good Wells Make Good News

A Special Report on Successful Cementing Jobs

July 15, 1958

CEALMENT* is a Dowell-developed cementing service that uses special latex-cement. This latex-cement has low fluid loss and good sealing characteristics. When set, it has demonstrated excellent resistance to shattering. These properties make possible results like those reported here.

- **Southern Saskatchewan, Canada.** A well in the South Alida Beds pool of the Nottingham field was making only 50 bopd and 50 bwpd. The formation—of the Mission Canyon series—was squeezed with 400 gallons of Dowell latex-cement. Final squeeze pressure was 2000 psi. *After re-perforating, well tested at a capacity rate of 300 bopd with negligible water. Six months later, capacity of well was unchanged; water production was negligible. Potential still exceeded production.*

- **Midland County, West Texas.** This well was to be completed with pay zones in Devonian and the Strawn. Since both zones might need stimulation, separation was necessary. A 5½-inch liner was set from 9963 to 11,545 feet using 2000 gallons Dowell latex-cement. *As a result, communication between zones was prevented.*

- **Baton Rouge Parish, Louisiana.** This well had a hole in the casing at 6940 feet, which was above the primary cement job. Cealment was selected to repair the hole. 800 gallons of latex-cement was squeezed using a pressure of only 100 psi. *After the remaining latex-cement was drilled out, casing held 1500 psi test pressure.*

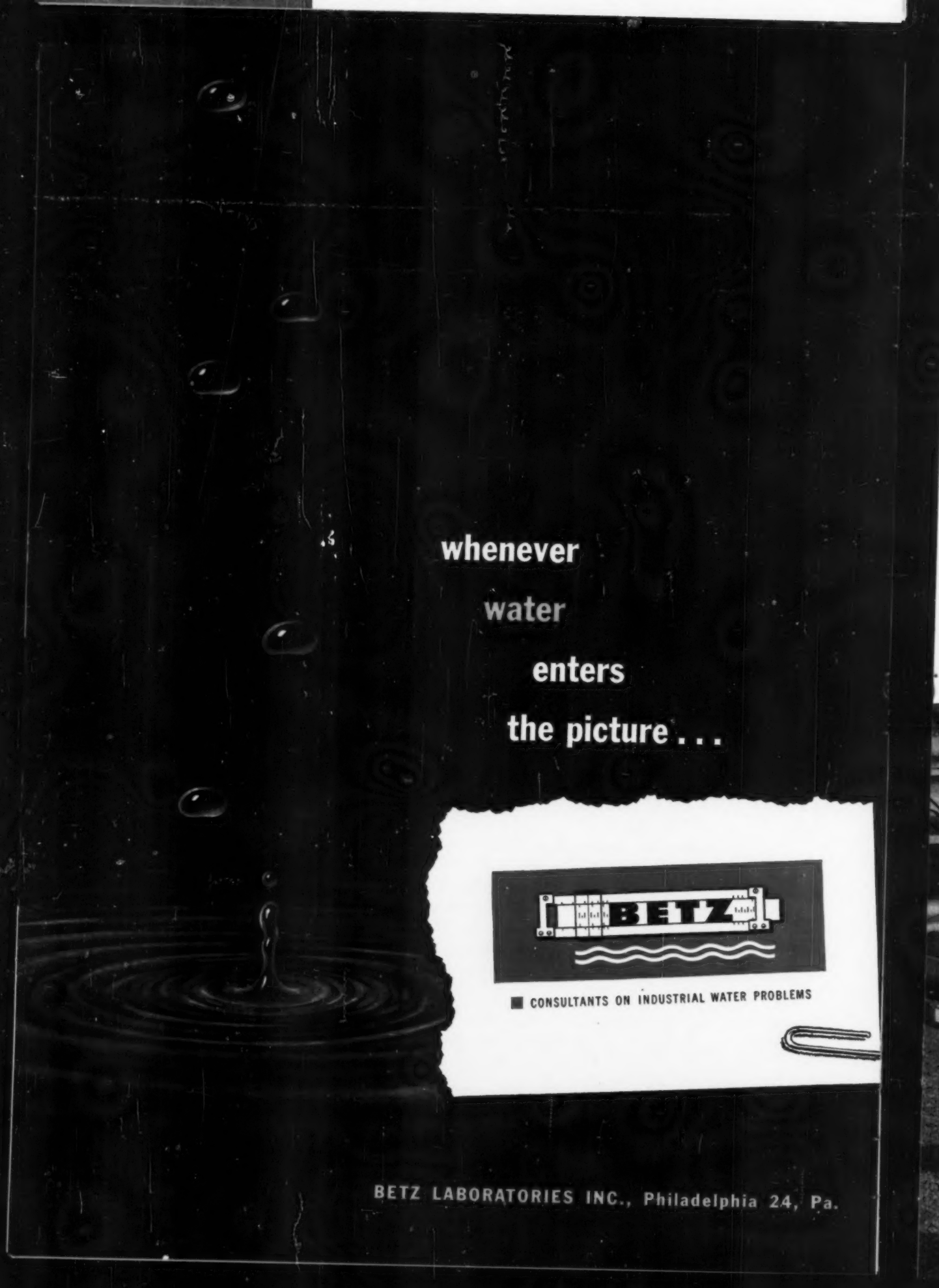
- **Marion County, East Texas.** A well was completed through perforations into the Henderson sandstone from 6039 to 6044 feet. It was acidized but channelled to water. To repair the channel, Dowell used Cealment with 500 gallons of latex-cement. After squeezing, drilling out and re-perforating, well swabbed 36 bopd but would not flow. Dowell cleaned the formation with 500 gallons of lease oil containing two per cent Mudlax.* *After treatment, well flowed 72 bopd by heads, with no water. All three treatments paid out in less than 10 days of producing time.*

For detailed information on Cealment, or prompt service, call any of the 165 Dowell service points. In Canada, call Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Or write Dowell, Tulsa 1, Oklahoma.

*Dowell Trademark

Services for the oil industry DOWELL

A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY


whenever
water
enters
the picture . . .
BETZ
CONSULTANTS ON INDUSTRIAL WATER PROBLEMS
BETZ LABORATORIES INC., Philadelphia 24, Pa.

here's important

new economy for you

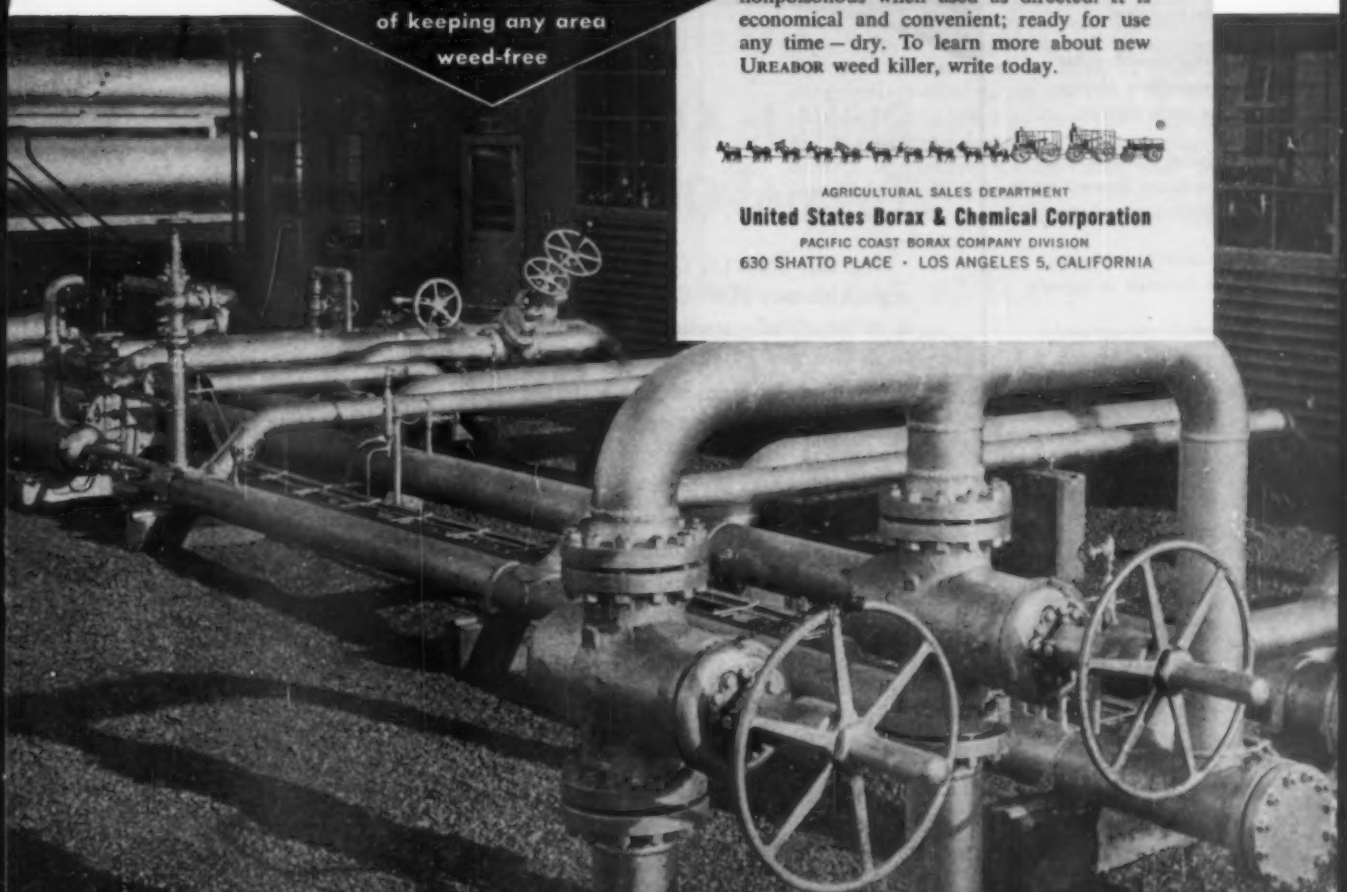
in weed control...

UREABOR® weed killer is a dependable performer. It's effective, easy to apply, low in cost, and provides long residual action. Now, for as little as 30¢ per 100 sq. ft., you can control vegetation for a full year in areas like the one shown here.

Granular, dust-free UREABOR is applied at low rates in its delivered form...dry. There's no mixing...no water to haul...no need for cumbersome spray rigs. UREABOR may be applied by hand. For most efficient treatment of large areas, a small special hand-operated spreader is available for $10.75 delivered, anywhere in the U.S.A.

UREABOR weed killer is safe – it is nonvolatile, nonflammable, noncorrosive and nonpoisonous when used as directed. It is economical and convenient; ready for use any time – dry. To learn more about new UREABOR weed killer, write today.

This new chemical can prove to be your most practical way of keeping any area weed-free



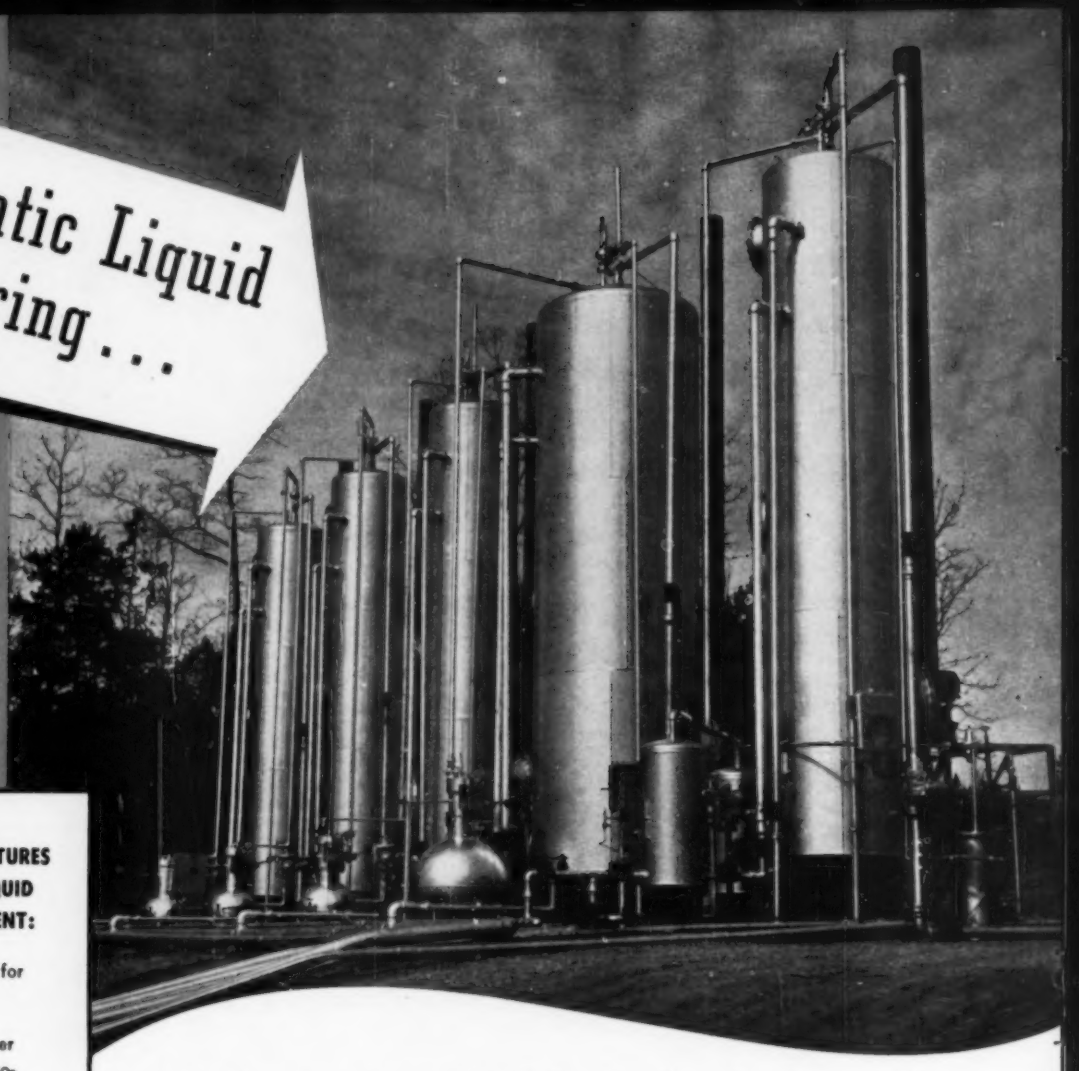
AGRICULTURAL SALES DEPARTMENT

United States Borax & Chemical Corporation

PACIFIC COAST BORAX COMPANY DIVISION

630 SHATTO PLACE · LOS ANGELES 5, CALIFORNIA

Automatic Liquid Metering . . .



OUTSTANDING FEATURES OF BS&B LEASE LIQUID METERING EQUIPMENT:

1. Compact in design for easy hook-up.
2. Available with either pneumatic or electro-pneumatic controls.
3. External adjustments on controls can be easily made without shutting in the unit.
4. All controls and valves are designed to fail-safe.
5. Controls are enclosed in tamper-proof housing.

Right In Step With Today's Trend Toward Oil Production Automation

At this Shell Oil Company lease in Wayne County, Mississippi, approximately 1000 bbl./day of 45 API gravity oil at 150° F. is automatically treated and metered through BS&B equipment from five nearby producing wells.

Each wellstream is first tested through the metering treater, and then is put on production through one of the other four treaters. One is 6 ft. in diameter and produces two wells, while the others are 4 ft. in diameter and produce one well each.

The test treater has vertical meters on the water and oil dumps (1 bbl.). All of the production treaters meter through BS&B Model B Low Pressure Spherical Metering Chambers.

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

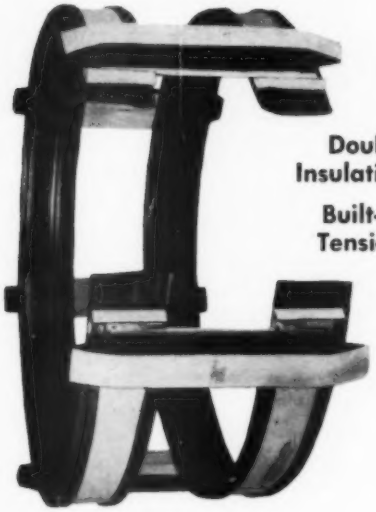
Plan now to install BS&B Metering Equipment on your lease for greater accuracy at lower cost. Ask your BS&B Man for full details, or write to . . .

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. 1-C7

P. O. Box 1714 Oklahoma City, Oklahoma

AGAIN "Something New and Better For Pipe Lines...



Maloney ENCIRCLEMENT CRADLE MODEL 58

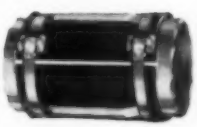
The Cradle that supports the carrier **all the way around.** The Model 58 Centering Cradle is a double steel band with ribbed rubber lining to provide insulation and protect pipe wrap. Runners are steel and Neoprene, providing double insulation, **performance proven** in miles of crossings on the Model 55 Maloney insulators. Built-in tension in the cradle bands hold it firmly in place during installation — without bolting. The Model 58 cradle is available in any combination of carrier-casing sizes to your specifications.

Maloney MOLDED CASING SEAL PULL-ON TYPE

The molded seal for **any job.** Double **accordian** design provides flexibility for eccentric installations, with plenty of room for longitudinal movement in **either** direction. Ribbed inner surfaces and stainless steel bands seal the rubber to the pipe to form an impervious joint. Maloney compounded rubber is extra thick at pressure and shear points eliminating the need for additional shielding. Long life, free from checking and other aging symptoms, is assured by production quality control of rubber compounding and molding. Installs with Stainless Steel banding for long life. Available immediately in the full range of size combinations.

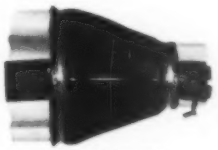
INSULATORS Maloney CASING SEALS

MODEL 55


MODEL 56

MODEL 57

SLIP-ON SEAL


ZIPPER SEAL

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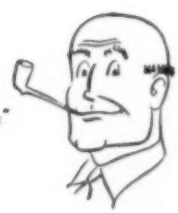

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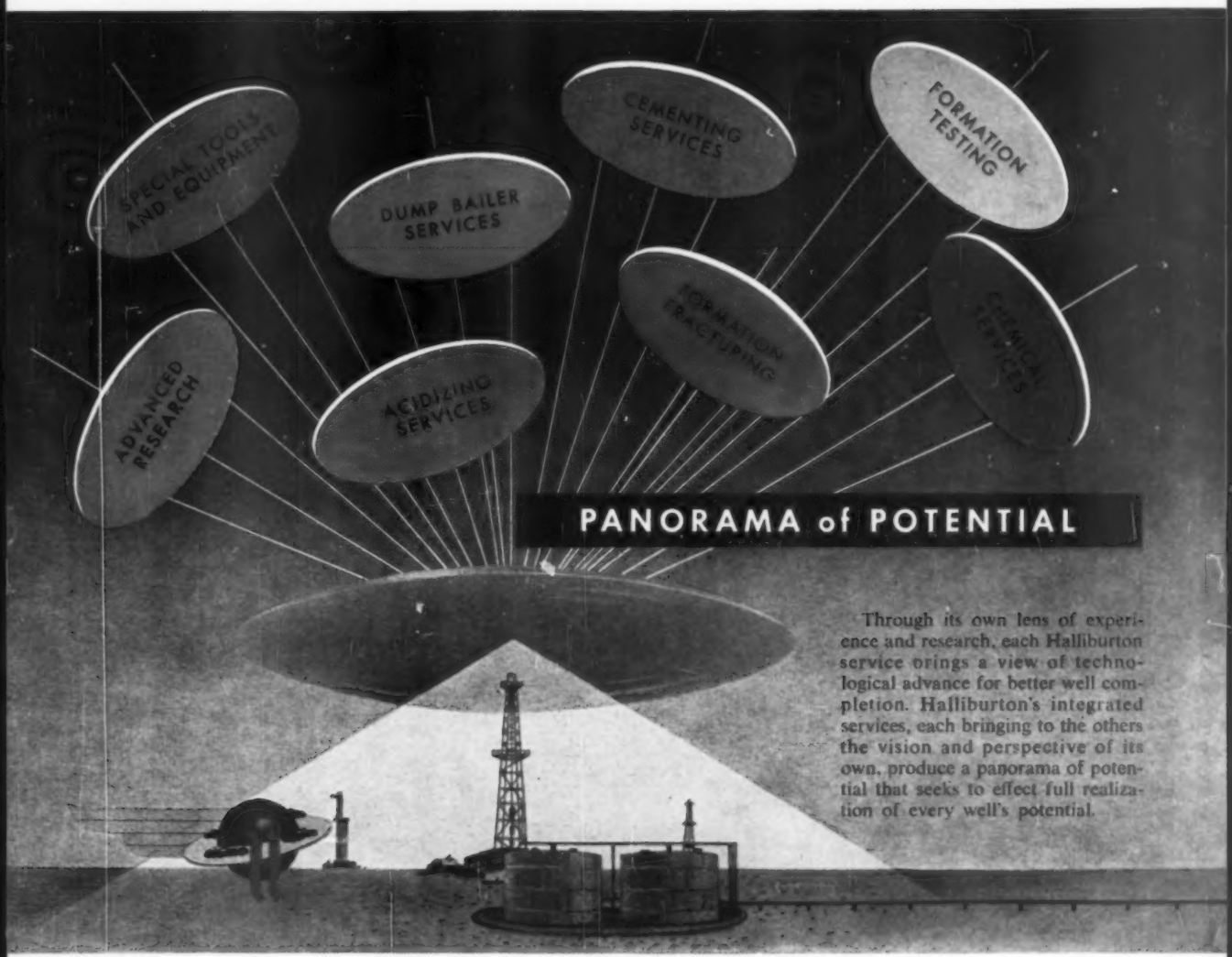
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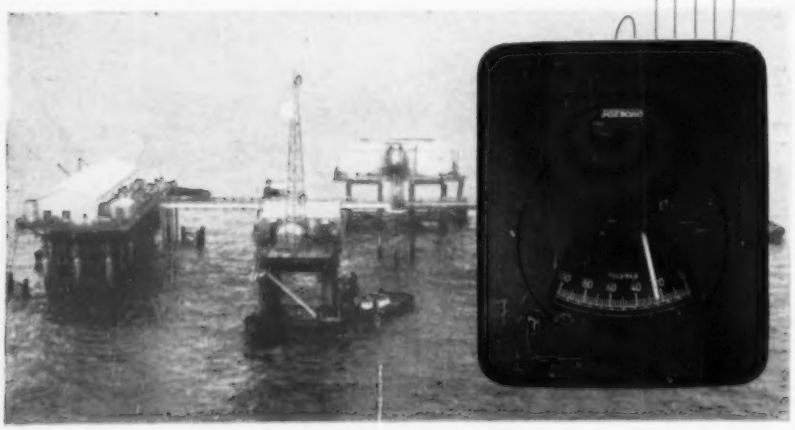
With Foxboro's Teletax Telemetering System, you can use the most advanced transmitting techniques: two wire lines, power lines, radio or microwave. As many as 25 different signals can be handled in each direction, simultaneously.



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The Teletax Transmitter houses either one or two standard Foxboro measuring elements — plus the Teletax transmitting mechanism. It will transmit to a control center hundreds of miles away just as easily as to one nearby. It also indicates or records locally if desired.

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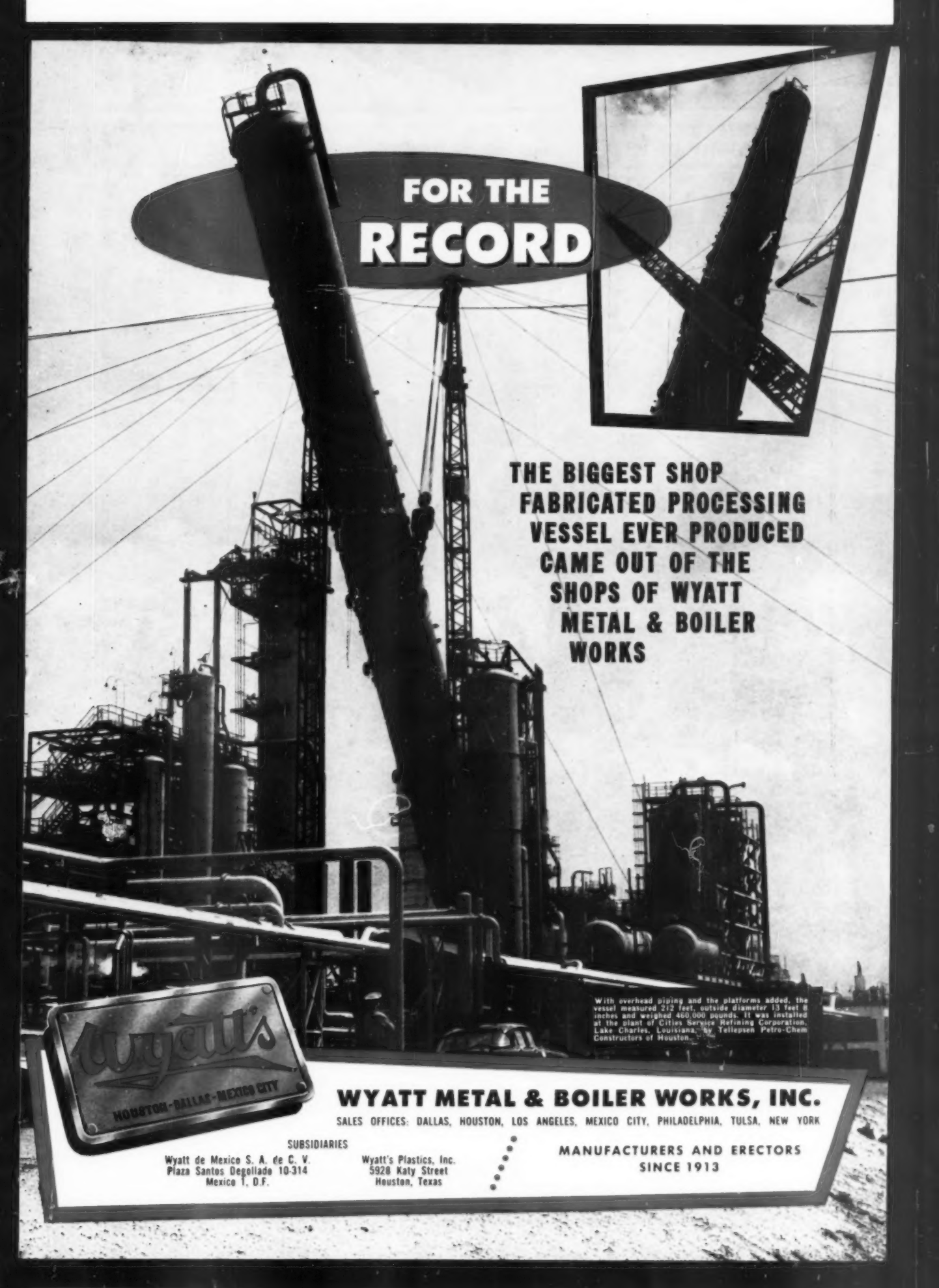
FOR THE
RECORD
THE BIGGEST SHOP FABRICATED PROCESSING VESSEL EVER PRODUCED CAME OUT OF THE SHOPS OF WYATT METAL & BOILER WORKS
With overhead piping and the platforms added, the vessel measured 212 feet, outside diameter 13 feet 8 inches and weighed 460,000 pounds. It was installed at the plant of Cities Service Refining Corporation, Lake Charles, Louisiana, by Tellepsen Petro-Chem Constructors of Houston.
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WEIGHT[1] OF FLUID ON PLUNGER IN PUMPING WELLS, LB. PER 100 FT.

Plunger diameter, in.	Rod diameter, in.	Wt. of rods, lb. per 100 ft.	Average gravity of liquid, deg. A.P.I.									
			16	20	24	28	32	36	40	44	48	52
1	⅝	110	20	19	19	18	18	17	17	17	16	16
	¾	162	14	14	14	13	13	13	12	12	12	11
1⅛	⅝	110	24	23	23	22	22	21	21	20	20	19
	¾	162	18	18	18	17	17	16	16	16	15	15
1¼	⅝	110	38	37	36	35	34	34	33	32	31	31
	¾	162	33	32	31	30	29	29	28	27	27	26
1½	⅝	110	61	59	58	56	55	53	52	51	50	49
	¾	162	55	54	52	51	50	48	47	46	45	44
	⅞	235	48	47	46	45	44	43	42	41	40	39
	1	295	41	40	39	38	37	36	35	34	34	33
1¾	⅝	110	87	85	83	81	79	77	75	73	72	70
	¾	162	82	79	77	75	74	72	70	69	67	66
	⅞	235	75	73	71	69	68	66	64	63	62	60
	1	295	67	66	64	62	61	59	58	57	55	54
1.7810	⅝	110	91	88	86	84	82	80	78	76	75	73
	¾	162	85	83	81	79	77	75	73	72	70	68
	⅞	235	79	76	74	73	71	69	68	66	65	63
	1	295	71	69	67	66	64	62	61	60	58	57
2	⅝	110	118	115	112	109	106	104	101	99	97	95
	¾	162	112	109	106	104	101	99	96	94	92	90
	⅞	235	106	103	100	98	95	93	91	89	87	85
	1	295	98	95	93	91	88	86	84	82	80	79
2¼	⅝	110	152	148	145	141	138	134	131	128	125	123
	¾	162	147	143	139	136	132	129	126	123	121	118
	⅞	235	140	137	133	130	126	123	121	118	115	113
	1	295	133	129	126	123	120	117	114	111	109	107
2½	⅝	110	191	186	181	177	172	168	164	161	157	154
	¾	162	186	181	176	172	167	163	160	156	153	149
	⅞	235	179	174	170	165	161	158	154	150	147	144
	1	295	171	167	163	158	155	151	147	144	141	138
2¾	⅝	110	234	228	222	216	211	206	201	197	192	188
	¾	162	228	222	217	211	206	201	196	192	188	184
	⅞	235	222	216	210	205	200	195	191	186	182	178
	1	295	214	208	203	198	193	189	184	180	176	172
3	¾	162	275	268	261	255	248	242	237	231	226	221
	⅞	235	269	262	255	248	242	237	231	226	221	216
	1	295	261	254	248	241	236	230	225	219	215	210
3¼	¾	162	326	318	310	302	294	287	281	274	268	262
	⅞	235	320	311	303	296	288	282	275	269	263	257
	1	295	312	304	296	289	281	275	268	262	256	251
3½	¾	162	441	429	418	407	397	388	379	370	362	354
	⅞	235	434	422	412	401	391	382	373	365	357	349
	1	295	426	415	404	394	385	375	367	358	350	343
4¼	¾	162	571	556	542	528	515	503	491	480	469	459
	⅞	235	564	550	535	522	509	497	485	474	464	454
	1	295	557	542	528	515	502	490	479	468	458	448
4¾	¾	162	718	699	681	664	648	632	617	603	590	577
	⅞	235	711	692	675	658	642	626	612	598	585	572
	1	295	704	685	667	651	635	620	605	591	578	566

[1]At 60 deg. fahrenheit. No allowance has been made for expansion of oil at the temperatures ordinarly encountered in wells. No allowance has been made for the lifting effect of any gas that may be present.

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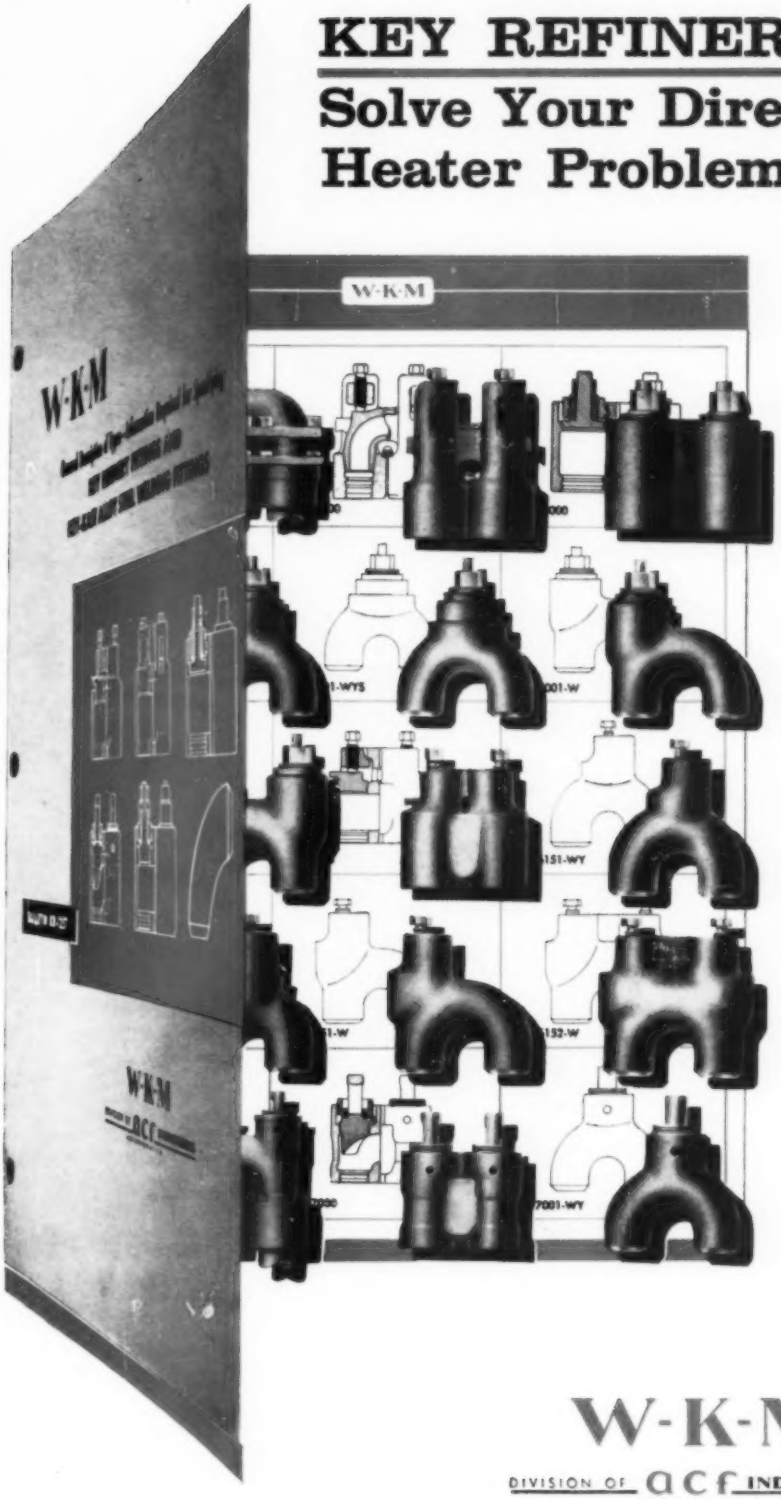

W-K-M's continuous research, broad experience and active participation in fitting design have been combined to anticipate your needs . . . W-K-M's engineers have solved most of your problems before they exist.

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This wildcat well drilled by Aramco in Persian Gulf, discovered second offshore field.

Petroleum Activities in 125 Countries

Conclusion of Eleventh World-Wide Survey

PHILIPPINES

R. C. 16,500 b/d
Runs 18,000 b/d

Biggest news in the Philippines is the contract signed by the government for Standard Vacuum Refining Co.'s new $34 million refinery at Limay on the east coast of the Bataan Peninsula. It will have a capacity of some 25,000 b/d. Only other refinery in the Philippines is the Caltex plant at Batangas. Shell is still negotiating to build a refinery in the Philippines.

Consumption in the Philippines runs about 46,800 b/d, of which all but the 18,000 b/d of crude for the Caltex refinery are imported products, an unfavorable exchange for the country.

In spite of failure so far in the long period of exploration in the Philippines, there are 18 companies holding concessions and a number of them are being worked. Stanvac spent $3 million in the 1956-57 period on exploration of its concession. The company drilled one well to 10,000 ft, which was dry, and expect to drill another.

San Jose Oil Co. (Pantepec and Pan Coastal) holds concessions of about 2.7 million acres over which it is carrying out magnetometer surveys. Philippine Oil Petroleum Development, a local company, is also carrying out aerial magnetometer surveys. White Eagle Oil has seismic surveys planned for its holdings.

POLAND

Prod. 3800 b/d? **R. C. 15,000 b/d?**
Runs 15,000 b/d?

An effort was made by the Polish Government early this year to reduce consumption by 20%, but gasoline rationing was taken off after three months. Main difficulty was in transporting Romanian oil through Hungary to Poland after the uprising there.

Polish production runs about the same as last year, but consumption has risen to 34,000 b/d.

A new refinery of 5000 b/d capacity is planned for Konin, in West Poland.

PORTUGAL

R. C. 25,000 b/d
Runs 17,000 b/d

Mobil Exploration Portugal (Socony Mobil) carried out exploration work on the concession held by Companhia dos Petroleos de Portugal (Portuguese Government and Axel Johnson of Sweden).

Only refinery in Portugal is that of SACOR at Caboruivo. It has runs of about 17,000 b/d, which fills the Portuguese demand.

PORTUGUESE GUINEA

Jersey Standard has negotiated for an 11-million-acre concession in this West African Colony on a 50-50 basis. The permit covers both land and offshore areas. The company agreed to spend a minimum of $7 million within 5 years.

PUERTO RICO

R. C. 68,500 b/d
Runs 36,200 b/d

Commonwealth Oil Refining Co. has enlarged its plant at Guayanilla to 55,000 b/d capacity. With the Caribbean Refining Co. plant at San Juan, which has 13,500 b/d capacity, Puerto Rico can now export products. The country's consumption averages 28,600 b/d.

Changes were made in the Puerto Rican oil and gas laws to make them more inviting to companies interested in exploring the island for oil.

QATAR

Prod. 141,000 b/d **R. C. 600 b/d**
Runs 600 b/d

Qatar Petroleum (IPC) operated 2 rigs at Dukhan field until November of last year; one rig was shut down in December. Five producers were drilled.

Shell drilled a third test in 80 ft of water, 35 miles from land. The first 2 were dry. Since 1953 Shell has spent $21 million on offshore exploration. The first mobile drilling platform was wrecked in the Persian Gulf.

Only refinery is a small one at Umm Said.

ROMANIA

Prod. 246,000 b/d? **R. C. 200,000 b/d?**
Gas 484 m³cf/d? **Runs 160,000 b/d?**

The Romanian Government is paying off the USSR with production in return for its oil industry. Production has gone up some with new fields in Moldavia, Oltenia, and Pitesti region, Transylvania, and the Vedea district. New areas are having to make up for the steady downturn in production from old fields. Some 11 million bbl of Romanian oil were shipped to non-Communist countries in 1957 and Romanian supplies go to a number of Communists countries in eastern Europe.

SAKHALIN

Prod. 19,000 b/d

Russia holds this island, the south half of which was once owned by Japan. Both the north and south produced oil at one time, and it is believed that exploration work has been diligent in this area where any production is doubly important because of scarcity of fuels.

SARDINIA

Because Sardinia and Sicily have their own oil laws and operate them independently, we carry them separately from Italian activities.

Only permit issued so far to explore for oil on the island has been granted to Societa per Azioni Idrocarburi Sardegna.

SAUDI ARABIA

Prod. 992,114 b/d **R. C. 189,000 b/d**
Runs 192,623 b/d

Arabian American Oil Co. found a second offshore field in the Persian Gulf at Manifa, 8 miles from the coast. During 1957 the 4 drilling rigs operating completed 17 wells, only one dry; 9 were oil producers offshore. Four seismograph crews were in the field and three crews doing structure drilling. One geophysical crew is conducting a gravity meter-magnetometer survey.

An exploratory well 'Ain Dar 56, drilled 12 miles north of the northernmost well in the 140-mile long Ghawar field, has discovered oil and has been completed as a potential producer at 7120 ft.

An agreement the last of the year was made between Saudi Arabia and Japan, giving a Japanese company an offshore oil concession between Saudi Arabia and Kuwait (see Kuwait Neutral Zone).

One of the greatest oil deposits in the world, the last reserve estimate made at the end of 1956 was 34 billion bbl of oil.

The country consumes about 25,000 b/d and exports all other crude and products.

SICILY

Prod. 20,400 b/d **R. C. 55,000 b/d**
Runs 40,000 b/d

During 1957 AGIP (ENI) discovered the Gela Field, on the south coast near the town of Gela. Four wells were completed and a production of several hundred barrels per day was delivered to the Rasiom refinery at Augusta. The oil is heavy and viscous — within the range of 7 to 10 API gravity — and must be diluted with distillate to flow.

Also, AGIP has found oil in a wildcat in the Noto Permit near the village of Rosolini in southeast Sicily. A second well has been spudded in this area. Rimrock has obtained controlling interest in Societa Olii Minerali, which has an exploration permit on the north coast.

In the Ragusa field, Gulf Italia completed 16 development wells and one wildcat, Fortugno No. 1, abandoned at 7280 ft. The company also completed 3 wildcats in Central Sicily.

Two Italian companies — Mediterranea Raffineria Siciliana Petroli and ISLOM — each have permission to erect a refinery, the former at Milazzo, northeast, and the latter at Palermo, northwest, with capacities of 50,000 b/d and about 20,000 b/d respectively. ENI is studying a project for a refinery and petro-chemical plant to treat crude from Gela field and from the Belaim-Aba Rudais fields in Egypt in which it has an interest.

SINGAPORE (British)

One of the largest oil trans-shipment installations in the world is that of Shell on Island of Pulo Bukom, off Singapore, which is the the tip of the Malay Peninsula. Shell also has laboratories at Singapore.

SOMALIA

Sinclair Somal Corp. (Sinclair 50%, Conorada 50%) abandoned the two wells it drilled on its 90,000 sq mile concession. The third well is now drilling.

Mineraria Somalia (ENI) is drilling a second test on its 11,580 sq mile concession in the north. The first well drilled here was abandoned in 1956.

Stanvac has been granted a 10,300 sq mile concession in the west part of the country extending along the Ethiopian frontier. The permit is for 3 years and may be extended 3 times for 3-year periods. The company has one geophysical crew operating. Exploration permits are held by a Canadian firm, Frobisher Oils, and by a Texas operator.

Somalia is a U.N. mandate in East Africa.

SOMALILAND (BRITISH)

The Conorada group (Continental, Ohio, and Amerada) has drilled two dry holes below 5000 ft on its 36,000 sq mile concession and is now drilling a third well.

Stanvac has an 11,000 sq mile concession here, where it has done some geological and geophysical work preparing to drill this year. BP continues to explore its 6000 sq mile concession in the northwest.

SPAIN
(and territories)

R. C. 140,000 b/d
Runs 110,000 b/d

Spain's advancing economy, which depends to a large extent on petroleum energy, had another upswing in consumption in 1957. This country now uses about 100,000 b/d, all of which is imported, mostly as crude for the three refineries. Throughput capacity at REPESA (Caltex 25%, INI 52%, and CEPSA 24%) was increased to 60,000 b/d. CEPSA's Tenerife (Canary Islands) refinery now has a capacity of 63,000 b/d.

INI, the state enterprise, proposes to build a 25,000 b/d oil refinery at Puertollano, 130 miles south of Madrid.

The sharp increase in demand has accelerated interest in oil exploration. Except for concessions granted CIEPSA and CAMPSA, the government has reserved all oil rights in Spanish territories. At present there is an enforced law requiring that 75% of the capital of an oil company must be held by Spanish nationals. Recently there have been indications that this restriction on foreign capital would be lifted.

CIEPSA, a subsidiary of CEPSA, has a working agreement with a German concern, C. Deilmann Bergbau, which has found some small gas deposits in 2 wells in 1957 and some oil in a third.

VALDEBRO (INI 50% and General American Oil of Texas et al 50%) are drilling on their 15th well. Some non-commercial gas has been found and a show of oil encountered in one test. General American and INI have spent $10 million on exploration and have plans for substantial additional outlays.

There are 7 drilling rigs operating in Spain; seven wells were completed in 1957, of which 4 had gas shows. Ten geological and 5 geophysical crews are working in the country.

SUDAN

Negotiations for an exploration concession are going on between the government and a U. S. oil group.

SUMATRA
(See Indonesia)

Prod. 290,500 b/d **R. C. 171,000 b/d**
Runs 166,500 b/d

Caltex's operations in Central Sumatra were closed down at one time at the beginning of the year because of Indonesia's civil war. Later they were opened up and were undamaged.

Stanvac's producing activities in the Lirik area also were interrupted for a short period. Reports are that the rebels were overcome in Sumatra. Other action against the central government continued in East Indonesia.

SWEDEN

R. C. 47,000 b/d
Runs 44,000 b/d

Sweden has no oil production although a search has been carried on several years by the geological survey department.

There are three refineries, all belonging to local companies.

Consumption in Sweden declined slightly last year, possibly because of the new energy tax on gasoline. It still runs some 175,000 b/d.

SWITZERLAND

A proposal has been made by the Swiss Government that federal authorities should have supervisory power over the Cantons in all matters concerning oil and gas search and development.

An agreement has been made between a group of Swiss independents and Jersey Standard for a concession in the Canton of Berne. Rimrock has a concession through purchase of Mofag Oil Exploration Co.

Only refinery Switzerland had was at Rothkreuz; it was dismantled and shipped to Alexandria, Egypt. Now the Societe Financiere Italo-Suisse proposes to build a refinery near Stabio, south of Lugano, to use crude from the Middle East. Switzerland's oil consumption runs some 52,000 b/d, all imported products.

SYRIA

In 1957 Syria made an agreement with the USSR to borrow money and technical aid for developing the country.

During the Suez crisis last year the Syrian pumping stations on the Iraq Petroleum pipelines were blown up. This has decreased oil transit revenue. Temporary pumping sets were installed to increase the flow of Iraqi oil pending repairs to the main pumping station. At present the government is negotiating for higher revenues from Tapline.

Before the Russians agreed to help with oil development, there were two exploratory programs. One was carried on by a subsidiary of Deutsche Erdoel AG, a West German oil concern. It drilled its first well in northeast Syria, about 70 miles south of the Turkish oil field. Two seismic crews are working on the concessions.

The other exploratory program is being conducted by MenHall Prospecting and Exploitation Co. (controlled by J. W. MenHall of Benton, Illinois) in association with Atlantic Refining and Portsmouth Steel Corp. Geological and seismic work was carried forward during 1957 on oil prospecting permits held by this group. Two moderately successful wells were completed by this group at Karatchok in 1957. One dry hole was drilled in 1958. Oil has been found in two additional wells drilled during the current year in the same area but these wells have not yet been completed.

A Czechoslovakia firm, Technoexport, is building the state-owned refinery at Homs at a cost of $14 million, the first refinery to be built in the country. It is on the route of the Iraq Petroleum pipeline to Tripoli and Banias and will have a capacity of 15,000 b/d. This will just about cover Syria's consumption, which runs at present around 12-13,000 b/d.

TANGANYIKA
(See Zanzibar)

BP-Shell Petroleum Development Co., in 1957 began its third deep test at Mandawa on the south coast of Tanganyika, East Africa. Exploratory surveys are also being carried out in other parts of the country.

More than 5000 b/d products are imported and consumed in this country.

TIMOR (Portuguese)

This Portuguese overseas territory will be explored by Jersey under an agreement with the Portuguese Government. The new concession covers 17,000 sq miles on the mainland and offshore areas. Jersey will spend a minimum of $7 million in the next 5 years. The agreement is on a 50-50 basis. Very close to the area is the test well now being drilled in southern Senegal by Societe des Petroles du Senegal.

Timor Oil Company has done considerable preparatory work on its concession (held since 1954) and it expects to drill 5 exploratory wells. The company is owned by a Portuguese citizen and is supported by U. S., Canadian and Australian capital.

TRIESTE

R. C. 32,600 b/d
Runs 26,000 b/d

Esso Italiana and Aquila S.A. Tecnico Industriale each have refineries here, both of them modernized and expanded in the last few years. Esso is installing a 1000 b/d Powerformer at its plant.

TRINIDAD

Prod. 93.424 b/d **R. C. 155,000 b/d**
Runs 152,000 b/d

Crude production in Trinidad during 1957 increased by 17.8% over 1956.

Comparison drilling and production statistics are:

	1956	*1957*
Total crude oil production	28,928,800	34,100,000
Average number of rigs	27	29
Wells completed	263	314
Producers (oil or gas)	225	278
Success ratio	86%	90%
Footage drilled (ft)	1,110,745	1,321,354

Dominion Oil Ltd. carried out a slim-hole drilling program in the Gulf of Paria from a floating platform. Depths have exceeded those previously reached by others using a similar technique.

Trinidad Petroleum Development Co. temporarily abandoned Cedros-7 at a depth of 8800 ft, while two deep tests, Los Bajos-58 and Palo Seco-418 were completed at depths of 9632 ft and 11,788 ft, respectively. MW-45 was completed as a discovery well to the Herrera formation in the Rock Dome area. Shell Trinidad drilled 4 regional appraisal wells in the Ortoire Area without finding new production, but successfully completed 4 wells in the Inniss field. Apex (Trinidad) Oilfields drilled Cedros-2 to 13,045 ft and tested.

Kern Trinidad Oilfields Ltd. drilled one test to 6010 ft; Antilles Petroleum (Trinidad) Ltd. drilled a well AT-3 in the

Activity in Gulf of Paria, between East Venezuela and Trinidad, increased activity in the island last year and more marine drilling is scheduled this year.

Ortoire area. Trinidad Oil (purchased by Texaco in 1956) drilled exploratory wells in the Barrackpore and Guayaguayare area, which resulted in some successes, although the deep Cretaceous formations south of Barrackpore was again negative.

Development of secondary recovery operations continued with extension of the water flood project at Forest Reserve. Five gas injection projects at Forest Reserve are in operation and a small gas injection project was started in Barrackpore/Wilson field.

Offshore a number of successful wells were completed and a multi-well concrete drilling platform has been placed in operation. Texaco has a ⅓ interest in other large marine leases in Trinidad territorial waters. A mobile drilling barge is scheduled for delivery early in 1958 for further drilling.

Total number of refineries remain unchanged at three, with a total processing capacity of 155,000 b/d. Through technical improvements and modifications, capacity of the Pointe-a-Pierre refinery was increased from 80,000 to 100,000 b/d. A new 40 ton-a-day acid plant at this refinery commenced operations in September. An 8000 b/d Platformer is under construction.

Importations of crude oil from Venezuela and Colombia continued at a slightly increased level over the previous year's imports. Consumption on the island is 36,000 b/d.

TRUCIAL COAST

Abu Dhabi Marine Areas Ltd (BP ⅔ and Compagnie Francaise des Petroles ⅓) drilled the first under water deep test off the Trucial Coast in 1957. The barge on which the drilling is done was prefabricated and moved by sea transport and helicopters to the barge about 20 miles from shore, in over 50 ft of water.

Petroleum Development (Trucial Coast) (IPC) abandoned Shuweihat No. 1 in November after reaching 12,360 ft. A test well, Juweiza No. 1 was spudded in August 30, some 20 miles from Sharjah. It had reached a depth of 4909 ft at the end of December.

TUNISIA

Gas 574 mcf/d

Conorado (Conoco, Amerada, and Ohio) obtained a concession of more than 11,000 sq miles in south Tunisia under a 50-50 profit sharing agreement. The company expects to invest about $4 million over a 5-year period on exploration. This is the first company to be granted rights without government participation.

State-owned Societe de Recherches et d' Exploitation des Petroles en Tunisie (SEREPT) has 4 rigs working in the country, and in 1957 drilled 4 dry holes. The company has found some gas production, with an estimated 6 billion cu ft of reserves.

Consumption in this North African country is 8300 b/d oil products. There is no refining.

TURKEY

Prod. 5700 b/d **R. C. 6900 b/d**
Runs 5500 b/d

Esso Standard (Turkey) Inc. has been drilling in Thrace, European Turkey. The well is about 8 miles from Istanbul. Atlantic, Seaboard, and Tidewater conducted geological and seismic work programs on their jointly-owned acreage and spudded in their first exploratory well in December, 1957. D. D. Feldman Oil and Gas assigned a 75% interest in its Turkey concessions to Gulf. Turkish Gulf is now the operator and is continuing exploratory work. Bolsa Chica Oil Company began drilling operations in southeast Turkey shortly after the first of 1958.

Twenty or more companies are already in the country and considerable exploratory work is being done. Recently the Government granted Deutsche Erdol AG 8 concessions totalling about 1.7 million acres. Five of the areas are adjacent to the company's concessions in Syria, where it is now drilling. Caltex's well near Gaziantep, about 30 miles from the Syrian frontier, was dry.

Deilmann Petrol put in 12 party months of seismic work, 3 on a magnetic survey, and 12 on geological work.

Final agreement was reached in 1957 between the Government and 4 companies — Socony Mobil, BP, California-Texas, and Shell, for construction of a 65,000 b/d refinery. The participating companies will form a jointly-owned company with Mobil Overseas having 37%, Caltex 34%, Shell 18% and BP 11%. Estimated cost is about $48 million.

Consumption in Turkey runs about 34,000 b/d. Lack of exchange funds holds demand down.

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TURKS ISLAND

A Standard of California subsidiary has the only exploratory rights in and around this island in the Bahamas.

UGANDA

This inland African country, south of the Sudan, northwest of Belgium Congo, still looks for foreign capital to search for oil. There are oil seepages in the country, but test wells have not been particularly encouraging. Shell and BP have both done some exploration in the country, but no company is working there at present.

Imports to satisfy consumption run about 3000 b/d.

UNION OF SOUTH AFRICA

R. C. 21,100 b/d
Runs 21,400 b/d

Only oil refining here is at the Stanvac's plant at Durban. The company is making some additions that will expand the plant to 26,500 b/d.

It is reported Shell has proposed an 80,000 b/d refinery at Durban.

SASOL, a government-owned firm, has been operating its synthetic-oil-from-coal plant for two years, but it has been far from economical. Rated capacity is 150,000 gal/d but it has not been running a third of that.

Consumption in Union of South Africa is 103,900 b/d. Besides the crude imported for the refinery, some 82,700 b/d products must be imported. If Shell gets government approval for its plant, present demand could be met.

USSR

Pd. 1,880,000 b/d? **R. C. 1,800,000 b/d?**
Gas 1950 m^2cf/d? **Runs 1,700,000 b/d?**

One recent official announcement stated that USSR would spend 4 billion rubles on petroleum industry expansion in 1958. At the official exchange of 26¢ per ruble this would be slightly over $1 billion (at free exchange much less). Although small in comparison to the $8 billion budgeted by U. S. oil companies for about the same purposes, this actually is one-third higher than the Soviet spent in 1957.

Oil production, according to the USSR's central statistical board, rose 17% in 1957 over 1956, to approximately 2 million b/d.

In 1957 gas production rose 15%, to 713 billion cu ft. Production of oil-industry equipment rose by one-third.

No specific figures were given for

drilling footage for 1957 — not even percentages. Only statement was that exploratory and operational drilling significantly increased during the year. For several years, however, figures given range around 15 million feet. As far back as 1950 annual footage drilled was about the same.

The second Baku is supplying the larger part of oil for the Soviet. Production has now begun in Bukhara in Soviet central Asia, north of Afghanistan.

Russia reported another super-deep well completion in Baku. Production of 500 b/d is from 13,780 ft. This is the 15th "super-deep" well in the Baku.

A Russian geologist has estimated oil reserves at 180 billion barrels. Whether these are proved or possible is not clear.

Refining capacity is almost never mentioned by USSR reports and it is thought that it probably lags behind crude production. Refinery runs are said to have increased 17% in 1957, although no specific figures are given. This would be the same as the crude production rise.

During 1957 parts of the new Stalingrad and Chernikovsk (near Ufa) refineries went into operation.

A major refinery is being built at Pavlodar in Kazakhstan. Other refineries are said to be nearing completion. The Central Statistical Board reported pipelines pumped 24% more crude and refined products in 1957 than in 1956. Total length of all trunk oil pipelines was given as 7146 miles the first of 1957. By 1960 the total length is expected to be about 9000 miles.

The 360-mile-lóng Almetyevsk-Gorky oil pipeline, 300 miles of the second Stavropol (Northern Caucasus)-Moscow gas pipeline, and the 125-mile Shebelinka-Dnepropetrovsk (Ukraine) pipeline were put in service.

Consumption in the country is unknown, although it probably roughly corresponds to production. Some crude and products are exported, but there are also imports from Eastern European countries.

During the Suez crisis Russia had a wonderful opportunity to gain friends and influence people by supplying oil to her neighbors, but if any nation received more than it had contracted for, there was no evidence of it. All exports from USSR amount to about 100-150,000 b/d.

UNITED KINGDOM

Prod. 1700 b/d **R. C. 696,800 b/d**
Gas 70 mcf/d **Runs 485,000 b/d**

Refining continues to expand although there was a slight drop in consumption during the year. This could have been due almost entirely to the Suez crisis, which limited imports, and the fact that taxes on products went up.

England. Shell Refining is installing a new distiller, with capacity of 80,000 b/d and a new hydrodesulfurizer of 16,000 b/d capacity at its Shell Haven refinery. Present capacity is 75,000 b/d and runs are about 69,000 b/d. Shell's Stanlow plant is installing a new Udex unit at a cost of $2.3 million. BP refinery, on the Isle of Grain, is at present expanding from 90,000 b/d to 140,000 b/d. It will add the production of aviation gasoline.

During 1957 the Esso refinery at Fawley was increased to 220,000 b/d by completion of a further atmospheric pipestill of 70,000 b/d capacity. Additional hydrodesulfurizing capacity was also completed. Construction began during the year on facilities to supply ethylene and butadiene to manufacturers installing process equipment near the refinery.

Wales. A new tanker terminal is being built for super tankers at Angle Bay, and a crude oil pipeline is being constructed from Angle Bay 60 miles to the Llandarcy plant in Wales. Esso has plans under consideration for installing a new refinery at Milford Haven in South Wales.

Scotland. An 18,000 b/d unit is being built at Grangemouth (BP) bringing capacity to 62,000 b/d.

British Petroleum has the only concession for exploration and production in the United Kingdom. It now has four rigs operating there and in 1957 drilled 48 wells — 35 are producers. This makes a total of 241 wells in the country. Three seismic crews worked in the east Midlands area.

For the first time consumers in East Lothians were supplied with natural gas. It comes from the Scottish Gas Board's Cousland well; is mixed with coal gas.

Turbo drilling was used for the first time in the United Kingdom by BP Exploration Company for production wells of about 3000 ft in the Egmanton oil field in Nottinghamshire. The turbo drill is of French manufacture.

One of the most interesting highlights of the year was the possibility advanced of importing liquefied natural gas.

Inland consumption in the United Kingdom of all petroleum products in 1957 was about 508,000 b/d, 2% below the previous year.

UNITED STATES

Pd. 7,187,300 b/d **R. C. 9,207,100 b/d***
Gas 3666 m³cf/d **Runs 7,919,000 b/d**

The production for 1957 is about 1% more than it was in 1956 according to Bureau of Mines, while imports at the rate of 1,032,000 b/d went up 10½%. Products imports at 529,000 b/d were up 7.3%.

Total demand, domestic and exports, amounted to 9,487,000 b/d, or 3.3% higher than 1956. Domestic demand at 8,929,000 b/d was only 2% higher than in 1956. Natural gas consumption increased 8% above that in 1956.

A total of 5,014 miles of new oil pipelines was built in the United States, last year, compared with 2750 miles built in 1956. The 1957 additions included 2480 miles of crude lines and 2534 miles of products lines.

URUGUAY

R. C. 27,000 b/d
Runs 24,000 b/d

State-owned ANCAP is doing some exploration. This has been mostly by contract with service companies.

ANCAP will enlarge its plant — the only one in Uruguay — at Montevideo. It will have a 46,000 b/d capacity when completed. M. W. Kellogg is handling construction. Plans call for a distillation unit, vacuum unit, fluid catalytic cracker, and Platformer.

Consumption runs 30,000 b/d.

*July 1, 1958.

VENEZUELA*

Prod. 2,779,245 b/d **R. C. 670,000 b/d**
Gas 3 m³cf/d **Runs 660,000 b/d**

So far the poiltical changes in Venezuela have not interfered with oil and gas operations. In 1957 consumption ran 100,000 b/d and the remainder was exported — slightly over 2 million b/d in crude and 497,000 b/d in products.

There are 145 rigs operating in the country and last year 1746 wells were drilled. Of these 1583 were producers. There are almost 17 million acres under concession. This included the new acreage opened in 1957 of about 1¼ million acres, which brought $369 million to the government.

Socony-Sinclair completed their 20-in. 210-mile pipeline from Barinas to Puerto Cabello.

There are 12 refineries in the country, 2 of which are being expanded. Shell is adding an 50,000 b/d atmospheric distillation unit, a 33,000 b/d catalytic cracker, a 15,000 b/d steaming column, and a 2300 b/d alkylation plant at its Cardon refinery, and Creole is putting in a 700 b/d lube oil unit at Amuay. Socony Mobil announced early this year that it will build a $28 million refinery at El Palito, about 8 miles west of Puerto Cabello. Initial capacity of the refinery will be 40,000 b/d. It is expected to be completed late in 1959.

YEMEN

Oil and Gas Property Management sold its stock in Yemen Development Corp. to a group headed by Wallace Whittaker, N. Y. This syndicate carried on surface geological exploration during the year. Considerable Soviet activity in the area has deterred exploration work.

YUGOSLAVIA

Prod. 8100 b/d **R. C. 24,500 b/d**
Gas 70 mcf/d **Runs 24,000 b/d**

In the last 2 years we have not had a report on oil production in Yugoslavia. Our estimate has been low. Fields discovered in the last several years account for this increase. The largest one, at Ivanic Klostar, was discovered in 1954, and another one, not far off, was found in 1955. Recently other good showings have been promising, including a new field at Prkos.

Natural gas production has also increased and in Banat province gas is pipe from a nearby field to Vrsac. The line is to be extended to Belgrade.

Good prospects of oil and gas have been the result of high capital investment, amounting to some $160 million in the past 11 years. Recently capital funds have not been available and there may be a slowdown in development.

Yugoslavia is not self-sufficient; its consumption runs about 20,000 b/d.

ZANZIBAR

B.P.-Shell Petroleum Development has abandoned its deep test in Zanzibar at 14,281 ft, without finding oil. Another unsuccessful well was drilled on Mafia Island, (also a British Protectorate) off Tanganyika. The rig has been moved to the mainland and is now drilling at Mandawa.

*This is a capsule coverage of Venezuelan operations. For more detailed information see the Venezuelan issue of The Petroleum Engineer, November, 1957.

Reserves are estimated at about 15⅛ billion bbl of oil and 30 trillion cu ft of gas.

S. A. Year Book Out

"The 1958 Oil Directory of Key Personnel in South America and Year Book," published by E. Ospina-Racines, has been released. There are an estimated 2500 names and titles of top personnel in oil companies, drilling contracting firms, equipment and supply companies.

The 16 countries of South and Central America are included. Data concerns, addresses, cables, airmail, telephone, warehouses, etc. There are also complete tables of 1957 oil oprations by country and maps. The Directory, which is $23 for one copy, can be ordered from E. Ospina-Racines, Apartado Aereo 49-45, Bogota, Colombia.

BEAIRD-INGERSOLL-RAND Packaged Compressor Plant

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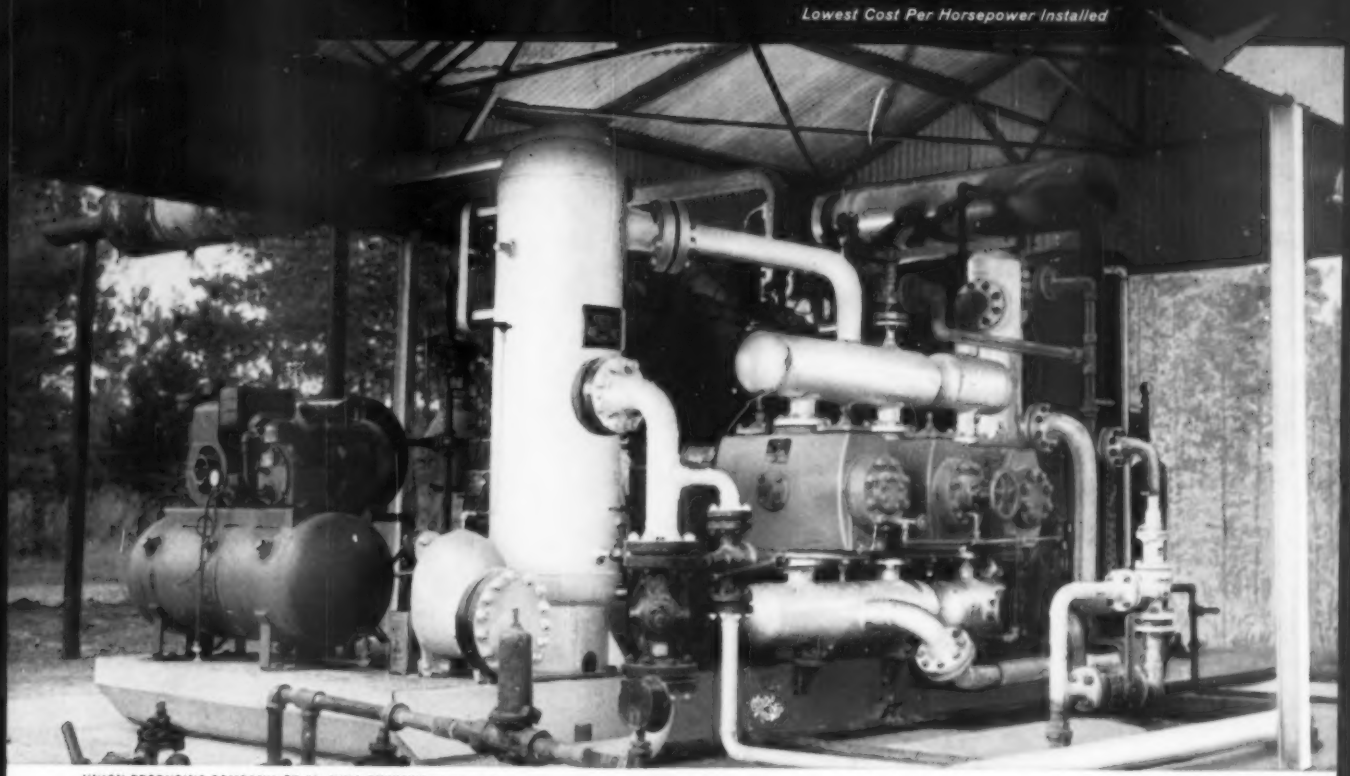

UNION PRODUCING COMPANY, ET AL. HULL STATION—equipped with a Beaird-Ingersoll-Rand 165 h.p. 6JVG Packaged Compressor. Unit has a Young Radiator with gas interstage, lubricating oil and engine cooling sections. Other Beaird compressors from 120 to 660 h.p.

Unit on Second Service—

FIELD CONVERSION FOR TWO STAGE OPERATION

Union Producing Company, et al., installed their Hull station in 1953 to boost gas in the Carthage Field. Consisting of one Beaird-Ingersoll-Rand 6JVG, 165-h.p. packaged compressor, the station handled 5.9 MMcfd with suction at 800 psig and discharge at 1300 psig.

During five years of production field pressures steadily declined until the original compressor could no longer operate efficiently. Rather than install a new unit it was determined that field conversion of the present compressor to two-stage operation would prove equally effective. This was quickly and economically done in the field. Two 7½-inch cylinders were placed on the first compression stage and a 5-inch cylinder on the second stage. Interstage gas cooling was provided by adding a gas coil at the front of the existing radiator. A scrubber for the second stage was installed and clearance bottle connections were provided on all cylinders.

The unit is now back in operation handling 2.5 MMcfd with suction at 100 psig and discharge at 300 psig. This field conversion will enable the unit to operate fully loaded down through final production of the field.

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Microwave Communication Terminal

205 The new Philco CLR-9 microwave terminal is designed to meet the requirements of communication for reliability, high channel density, and ease of maintenance. Performance reliability is increased by the use of tubeless power supplies — semi-conductor rectifiers of germanium and silicon replace tubes. Printed wiring panels increase circuit stability and are keyed for easy identification and replacement.

The CLR-9 wide baseband feature coupled with 1-watt power output, unitized construction and operation in the 6000 to 8000 mc frequency range afford flexibility of application and a high degree of performance. *Philco Corporation.*

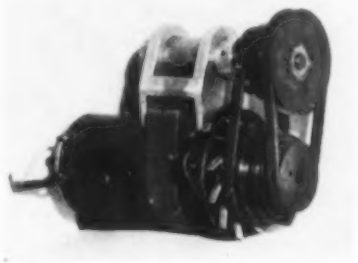
Largest Portable Rotary Air Compressor

206 What is believed to be the world's largest portable rotary air compressor manufactured to date is available from Le Roi. The new 1200RD2 is a twin-unit rated at 1200 cu ft per min of free air compressed to 100 psi. The twin-unit design of 2-stage, oil-cooled, sliding vane type compressors, powered by 2 diesel engines, is mounted on a unit welded steel frame and 4 tires. Length is 14 ft 6 in.; height, to top of hood, is 8 ft; width is 7 ft 11 in., within limits of all existing state highway regulations.

The unit operates at rated output speeds of 1800 rpm for the compressors and 2000 rpm for the engines. Compressors are coupled to the engines with hydraulically actuated clutches. Each unit has a 100 percent capacity control which matches air supply to air demands within a pressure range of 10 psi. Each unit has its own independent controls and can be operated separately for 600 cu ft per min delivery or together for 1200 cu ft per min. *Le Roi Division, Westinghouse Air Brake Company.*

Automatic Generator Overdrive

207 An automatic mechanical device for attachment to any standard automotive generator that produces maximum electrical current at any engine speed is manufactured by Welex. The Gen-O-Drive utilizes a stepped pulley arrangement to produce full current at curb idling speed to meet the electrical demands of 2-way radios,



air conditioners, and other accessory equipment on trucks, automobiles, etc.

The unit comes into service at the time the electrical load would ordinarily have to be carried by the storage battery. It permits maximum current and constant voltage regulation at idle or slow speeds, thus preventing overcharging or overheating from low voltage, or burned out components from high voltage. Once the engine is turning at about 1000 rpm (or about 20 mph), and electrical output from the generator is sufficient, the unit disengages automatically. *Van Landingham Bros.*

Dry Fluid-Drive And Couplings

208 Flexidyne, the dry fluid-drive introduced by Dodge, is being manufactured in a larger size with horsepower ratings 50 percent over the maximum recommended for drives and couplings of this type. The "fluid" in this unit is heat treated steel shot. A measured amount, called the flow charge, is contained in the housing, which is keyed to the motor shaft. When the motor is started, centrifugal force throws the flow charge to the perimeter of the housing, packing it between the housing and the rotor which transmits power to the load. After a brief starting period of slippage between housing and rotor, the two become locked together and achieve full load speed, operating without slip. *Dodge Manufacturing Corporation.*

Rugged Pipe and Tube Joint

209 Marman Conoseal pipe and tube joint provides a solution to the problems of connecting pipe or tubing of dissimilar metals which may be subjected to extreme temperatures and pressures. The tubing joint retains a perfect seal from − 300 F to +1800 F and rated capacity exceeds burst pressure of pipe used.

The joint lends itself to installation where working quarters are tight, requiring only 2 bolts to put together or take apart. The joint provides metal gasket compression with flexibility and sealing qualities formerly obtained only through use of organic seals. Seal is maintained with axial deflections up to 1/16 in.; slight parting of flanges under excessive or shock loads will not cause loss of pressure. Conoseal tubing joint is available in 3 different operation performance ranges to meet special application requirements. Standard sizes are available from stock and special sizes are designed to order. *Aeroquip Corporation.*

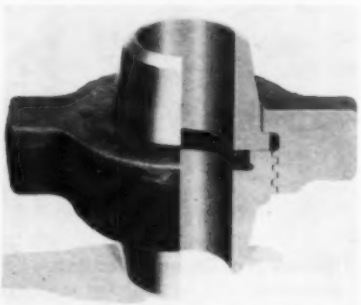
Pre-Fabricated Wire Rope Assemblies

210 To save time and reduce costs, Macwhyte Company offers a line of ready-made cable assemblies. Precision lengths of wire rope with fittings permanently attached by swaging are prefabricated to order. Assemblies are made ready for installation on equipment and can be carried in stock to assure correct fittings attached and correct length of wire rope for the machine intended. *Macwhyte Company.*

Flat Face Unions For Limited Space

211 Easy installation with positive sealing plus the availability of 3 types of sub ends are the major features of the new Weco flat face unions. Primarily for use in installations where space is limited, they allow pipe equipped with flat face unions to slip in place as easily as flanged valves or other flanged fittings.

A tough, replaceable, resilient seal ring is held under tension when the union is made up for positive sealing under all conditions of surge and vibration up to the union's rated pressures. Two pressure ratings are available for the union: 4000 psi and 6000 psi. Sub end connections are threaded, butt weld, or socket weld. *Well Equipment Manufacturing Corporation.*



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Automatic Tanker Loading Rig

212 United States Rubber Company and Asiatic Petroleum Company have built an automatic rig, developed by the rubber company, for conveying oil hose from dockside to ship's manifold. The rig, based on the operating principle of a pantagraph, is hydraulically operated by 1 man at a push-button control panel. With the new rig, the operator can steer two 12-in. oil hose lines directly to the manifold in 3 minutes. It weighs 22 tons, not including the 2 lines of suction and discharge hose and is 42 ft tall, not including the substructure.

The unit rotates on a table 15 deg each way, so that at the point nearest the ship's manifold there is a spread of at least 20 ft. For finger docks, the unit could be designed to rotate 360 deg. Wear on the hose is held to a minimum because vertical and horizontal rollers eliminate abrasion of the hose cover. *United States Rubber Company.*

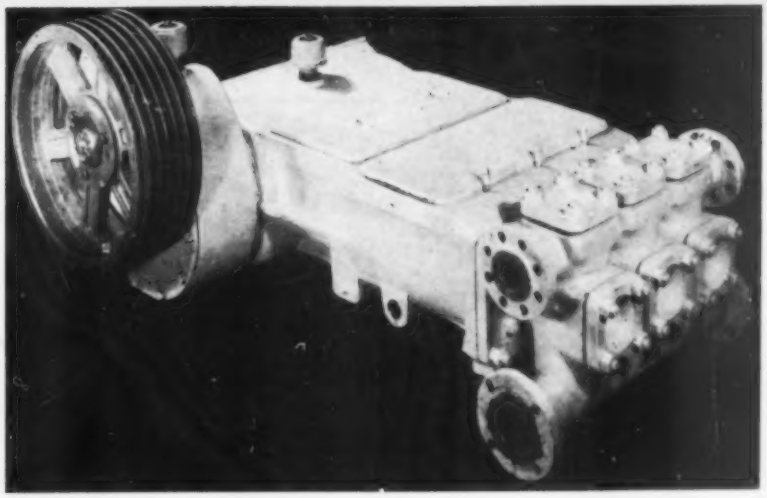
Corrosion Inhibitor and Anti-Icing Agent

213 Unicor-LHS is a film-forming additive designed both for use as a corrosion inhibitor and carburetor anti-icing agent. It is used in aggressive environments where acidic gases and moisture collect on condenser tubes and exchangers. It is completely soluble in light hydrocarbons and particularly useful in propane and butane storage and processing equipment.

Unicor-LHS is effective in preventing engine-stalling caused by ice formation in carburetors. The cost of treatment is very favorable when compared to the cost of using methanol, isopropanol, dimethyl formamide or any of the carbitols. It is available in 55 gal drums containing 380 lb net and in tank cars. *Universal Oil Products Company.*

Oil Sample Heater

214 An electric oil sample heater is a recent addition to the line of oil testing equipment of L-K Pump Valve Company. It affords an efficient means of electrically heating oil samples and can be connected to any 115-v line by simply tying in lead wires. Thermostat of the unit is set for usual oil sample testing temperature, but can be changed for higher or lower temperatures. This model is explosion proof, thermostatically controlled, and can heat up to 8 samples at one time. Permanent-type thermometers may be installed, if desired. *L-K Pump Valve Company.*



Plunger Pump Line Expands

215 A Bethlehem 4-in. stroke pump called the TP-4 has been added to their line of plunger pumps. A wide operating range is made possible by the availability of 2 fluid ends. The 4-in. by 4-in. triplex has a maximum capacity range of 6600 bbl per day at 438 psi to 2000 bbl per day at 1750 psi with the horsepower requirement up to 67 hp. Controlled gravity-flow lubrication system is said to guarantee complete dependability. Deep stuffing boxes for the 9 plunger sizes are easily removed and offer grease fittings as standard equipment. The pump is approximately 52 in. long, 33 in. wide, and 22 in. high, weighing 1730 lb.

Fluid ends of cast steel or aluminum bronze are available with proper trim to insure maximum durability. Applications include waterflooding, salt water disposal, crude oil gathering, or handling refinery products. An optional gear reducer, easily installed in the field, is available with a 2.73:1 ratio. It is adaptable for right hand or left hand drive. *Bethlehem Supply Co.*

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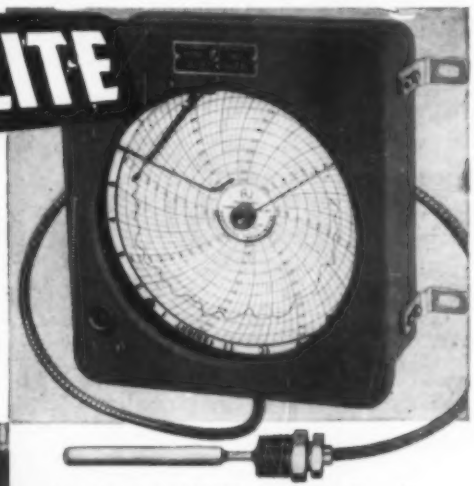
One of the many uses for Auto-Lite Recorders is the application shown below . . . a natural gas field meter run.



Auto-Lite Model "1000" Temperature Recorder has 6" chart. Various standard ranges from minus 40° F to plus 550° F. Available for wall mounting, portable or portable self contained use. Electric or mechanical chart drive. Choice of 24-hr. or 7-day cycle. Capillary tubing permits remote reading. Priced as low as $49.50. Manufactured to customers' specifications. Send for latest Catalog describing many types of Auto-Lite Recorders and Indicators.

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The Ridge Tool Company • Elyria, Ohio, U.S.A.

Gear Assembly for Wrench-Operated Valves

216 A lightweight planetary gear operator which adapts wrench-operated Rockwell-Nordstrom Hyper-seal valves to gear operation has been developed. It has a 5:1 gear ratio and 4:1 mechanical advantage. The gear operator fits directly over the square plug stem and down over the body of the valve. No special wrenches or hand-wheels are needed with the gear operator since the wrench normally used will fit over the operating pinion.

Attachment simply requires the tightening of a set screw on the valve plug stem and adjustment of 2 top screws which lightly contact the packing injector box. The plug stem projects through the gear operator, causing no interference with the valve's lubricating fitting. The assembly is offered in 3 sizes. *Rockwell Manufacturing Company.*

Plastic and Glass Cloth Laminate

217 The availability of KEL-F plastic laminate has been announced by The Garlock Packing Company. The new material is a plastic and glass-cloth laminate that can be cemented to any surface of almost any contour. The laminate is ideal for lining tanks, vessels, reactors, drums, and pipes. It has zero moisture absorption, high tensile strength and impact resistance, low cold flow, low temperature flexibility, is non-flammable and non-toxic. The material is impervious to all chemicals, all alkalies, and most solvents, and it is suitable for use at temperatures ranging from −100 to 350 F. The glass cloth backing below the plastic layer is a moderately tight, 7 harness satin weave, which furnishes a surface readily bonded to substrates of metal, wood, rubber, or plastic. *United States Gasket Company, Plastics Division of The Garlock Packing Company.*

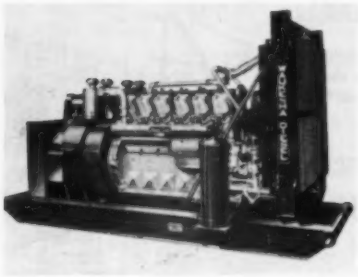
Self-Supporting Towers

218 The Diamond Truss self-supporting tower has been designed by Pioneer Industries to furnish towers that are economical in fabrication and erection and neat in appearance. The towers are furnished in a 4-legged structural tower or a 3-legged tubular tower.

Bracing in both faces of the tower originates at a common point on the columns and connects to the column flanges with simple bent plate connections welded to the inclined bracing beams. Connections require only that a proper set of holes be provided in the inside column flange for the bolted connections. A double action system in which the member can take either tension or compression stress reduces the number of members that are required for the complete framework. *Pioneer Industries, Inc.*

Turbo-Supercharged Enginators

219 Most powerful of the Waukesha Motor Company's line of engine-generators is the turbo-supercharged diesel-driven Model VLRDBSU Enginator, developing up to 800 kw at 1200 rpm for standby service, and having a continuous duty rating of 675 kw. The engine is a V-12 type, 8½ in. by 8½-in. bore and stroke, and a piston displacement of 5788 cu in. Maximum horsepower is 1190 at 1200 rpm when equipped with radiator and fan cooling.



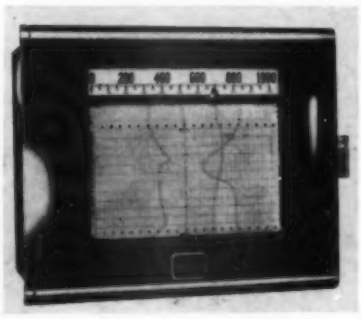
In addition to the turbocharged engine, Waukesha also builds a normally aspirated diesel and a gas fuel version in this V-12 series. The rotating field single bearing alternator is directly connected to the engine through a flexible drive coupling. The unit is furnished with electrical characteristics of phase, voltage, frequency, or current to suit the application requirements. *Waukesha Motor Company.*

Lightweight Generator Units

220 Two new 3000-w, gasoline-engine driven generators have been announced by Homelite. Weighing only 140 lb, the generators can be carried and used anywhere on the job. Both generators feature 4 percent voltage regulation and a generous overload capacity. Generator design eliminates d-c brushes, commutator and d-c armature windings to reduce maintenance costs. Power is provided by a 2-cycle gasoline engine directly coupled to the armature shaft. These two units, the 115-v, 60-cycle Model 8A115 and the 115/230-v, 60-cycle Model 8A115/230, provide a dependable source of portable power for operating electric drills, floodlights, and other power tools, or for emergency power. *Homelite.*

Printing Strip-Chart Telemeter

221 Bristol's multiple-printing strip-chart Metameter telemeter receiver will print out up to 16 separate records from as many telemetering transmission centers. Using a multiple-switching arrangement, the receiver can monitor a large number of values from any distance necessary. The variables need not be all of one kind, but can be a combination of pressure, flow, temperature, liquid level, etc.



The instrument prints on a 12¼-in. wide strip-chart, and is available with either a 5-second or a 15-second time-impulse telemetering system. *The Bristol Company.*

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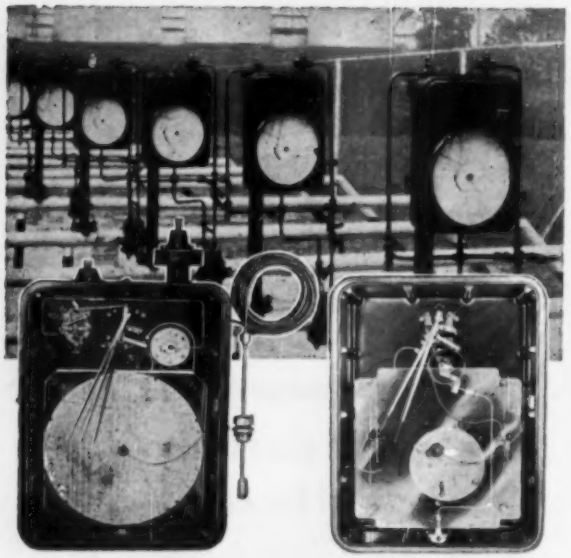
number for drop-head pipe dies unequaled for easy work, good threads and extra long service!

No wonder pipe "pros" have bought hundreds of thousands of them, the easy way they snap into the ratchet ring handle . . . the smooth clean way they cut ⅛" to 1" threads . . . the quick way the dies reverse for close-to-wall threads. You'll like OOR's, too—get 'em at your Supply House.

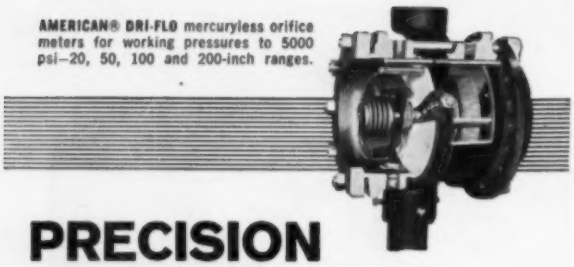
The Ridge Tool Company, Elyria, Ohio, U.S.A.



AMERICAN-WESTCOTT Series A-88 recording orifice meters for flow, pressure and temperature measurement—working pressures to 5000 psi—10, 20, 50, 100 and 200-inch ranges.

CANNON METER PENS for recording meters, available if desired, provide clear, legible chart records—hold up to a year's supply of ink.

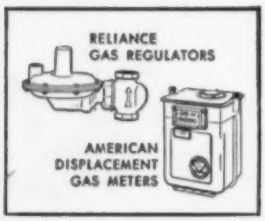
AMERICAN® DRI-FLO mercuryless orifice meters for working pressures to 5000 psi—20, 50, 100 and 200-inch ranges.



PRECISION MEASUREMENT

of flow, temperature, and pressure on one chart

Wherever precision measurement and economy of operation are required; at high or low flow rates, at varying temperatures, whether in recording, indicating, integrating or telemetering models, American orifice meters are synonymous with accurate, dependable, trouble-free service and low maintenance costs.



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INCORPORATED (ESTABLISHED 1836)

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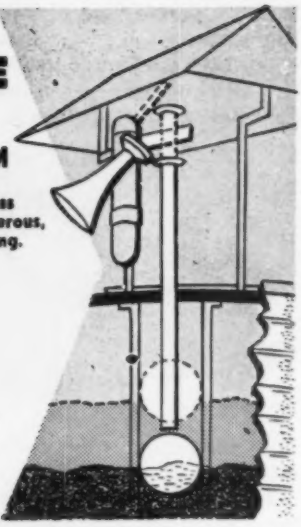
AVOID SPILLAGE

with FALCON TANK-LEVEL ALARM



Automatic warning prevents loss of product through often dangerous, always expensive tank overfilling.

- **NON-ELECTRIC**
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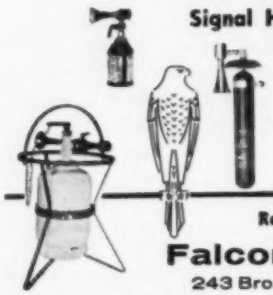
Float activates CO_2-powered horn at predetermined level, instantly sounds alarm.



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Portable Falcon signallers ideal for 1,001 industrial applications. Round-the-clock fire protection with U/L approved automatic Falcon fire detectors. Self contained, inexpensive, minimum maintenance.

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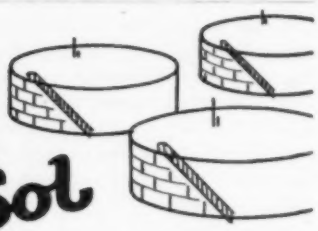

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Gasoline Driven Electric Plants

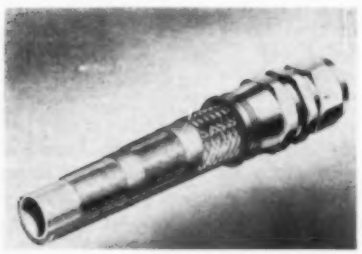
222 A new series of electric plants is available in either 10,000 or 15,000-w a-c size ranges in voltages to 460 v. Prime mover for the plants is a heavy-duty, 41-hp, gasoline engine. All electric plants are rated at 0.8 power factor, 3-phase; unity power factor, single phase. They are available in all standard a-c voltages, 50 and 60 cycle. Models are available with an optional rugged, weather-proof sheet-metal housing. For the unhoused models, these engine controls are standard equipment: Battery charge rate ammeter, electric water temperature gage, electric oil pressure gage, momentary start-stop switch, 2-way ignition switch, electric and manual start and output terminal block. *D. W. Onan & Sons, Inc.*

Chemical Cleaning and Hauling Service

223 One of the fastest growing service firms in the field of vacuum cleaning and hauling for the major division of the petroleum and chemical processing industries is Vacuum and Pressure Tank Truck Service, Inc. Using a specially designed large-capacity radio-equipped mobile truck, the company specializes in cleaning lease storage tanks, pipelines, separator tanks, wash racks and sumps, and in moving drilling mud, water, chemicals and other liquids. *Vacuum and Pressure Tank Truck Service, Inc.*

High-Pressure Teflon Hose

224 Development of a new high-pressure hose of Teflon with leak-proof "super gem" fittings has been announced by Aeroquip Corporation. Featuring a spiral wrap construction engineered for strength and resistance to impulse fatigue, the hose was designed for 3000 psi aircraft systems. Spiral construction prevents brinelling of the stainless steel wire, eliminates wire stress concentration and



provides optimum strength without sacrifice of flexibility.

The "super gem" fittings permit users to make-up hose assemblies in the field, and allow speedy alterations in length when new engineering refinements necessitate changes in hose dimensions. A metal-to-metal line seal in the fitting, combined with a lip seal formed by the tube of Teflon between the nipple and the sleeve of the fitting, assures positive grip and protection against fitting blow-off. *Aeroquip Corporation.*

Transistorized Two-Way Mobile Radio

225 The most powerful two-way radio used is available with a fully transistorized power supply. Motorola has announced the 100-watt unit as part of an expansion of its "T-Power" radio line which now includes 60-watt radiophones in the 144-174 megacycle band and 50 and 100-watt units in the 25-54 mc band. Four transistors are used in the 100-watt radio to replace both the vibrator and the dynamotor.

Transistorization of the power supply has reduced size and weight of the 50-watt low frequency unit, enabling mounting in a 10-in. wide housing that can be either dash or truck mounted. The radiophones can be operated from any 12-v primary power source with either positive or negative ground. *Motorola Communications & Electronics, Inc.*

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PVC PIPE

in oil-country use today

This proves that there is no substitute for Kraloy experience.

KRALOY is the most experienced manufacturer of PVC plastic pipe for the petroleum industry. The first polyvinyl chloride lead line installed in this country—at Great Bend, Kansas—was Kraloy Pipe. Kraloy High-Impact PVC today is preferred by production men for maintenance-free service in lead lines and disposal systems. Kraloy customers use Kraloy High-Impact PVC pipe for lead lines, gas lines, and salt water lines because Kraloy normally eliminates (1) sulphur corrosion due to sour crude, (2) paraffin buildup, (3) corrosion and scale, (4) trouble from soil electrolysis.

YOU Benefit From KRALOY'S Quality Control

To insure quality control, random samples of Kraloy Plastic Pipe are tested daily in Kraloy's own laboratory for burst pressure, impact resistance, and tensile strength under standard ASTM specifications.

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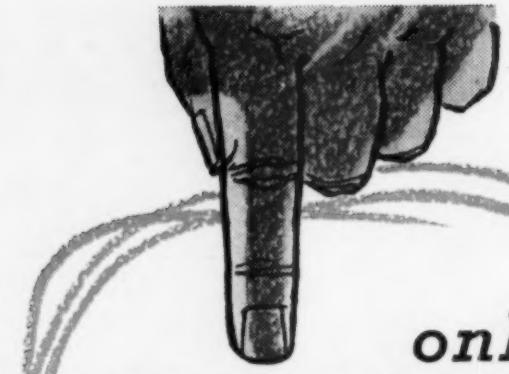
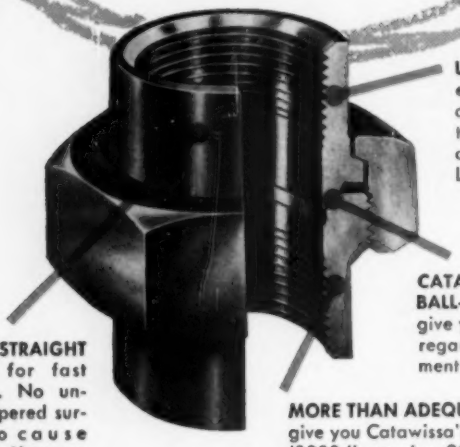


only
CATAWISSA
gives you all these features for your forged steel pipe union requirements



UNIFORM WALLS for even expansion and contraction under temperature changes. THEY FOLLOW THE PIPE!

CATAWISSA BALL-TO-ANGLE SEATS give you a "Perfect Seal" regardless of pipe alignment!

ROUND, STRAIGHT BARRELS for fast wrenching. No uneven or tapered surfaces to cause wrench slips or wrench locking!

MORE THAN ADEQUATE wall thicknesses give you Catawissa's 3-to-1 Safety Factor (3000-lb. service, 9000-lb. test; 6000-lb. service, 18000-lb. test)!

Catawissa Perfect Seal Pipe Unions are made by Union Specialists from 80,000-lb. tensile strength steel (ASTM Spec. A-105-55T, Grade II). Steel forgings from our own forging mill are closely checked for imperfections . . . and finishing on modern, automatic machines with close inspection during and after production give you pipe unions second to none!

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Collapsible Rubber Tank

226 Lightweight rubberized fabric tanks of 15,000 gal capacity that are completely collapsible are being adopted in the oil fields of the southwest to save costs and improve efficiency of operations.

The tanks, called "whales" because of their size and shape, can be rolled up into a package 8 ft long by 2½ ft in

diameter and weigh only about 1/10 as much as a steel tank with a comparable capacity.

When filled to capacity, the tanks are 47 ft long, 11 ft wide and 5 ft high. They are constructed of 2 plies of nylon fabric coated with a special Neoprene compound designed to protect the tanks against abrasion and atmospheric conditions. *The Firestone Tire & Rubber Company.*

Meter Features Diaphragm Construction

227 Using preformed highly sensitive diaphragms, the new Type 37 diaphragm meter manufactured by Foxboro is a mercuryless meter design. Measurement is unaffected by temperature variation of the liquid in the elements.

Differential ranges are 0-20, 0-50, 0-100 and 0-200 in. of water. Meter is available for 2000 psi maximum pressure. Pressure connections are tapped for ¼ or ½ in. NPT, optional by turning end caps. *The Foxboro Company.*

In-Line Hydraulic Oil Filter

228 A filter for in-line installation to handle hydraulic oil from 10 to 25 gal-per-min capacities at very low pressure drop has recently been developed by Marvel Engineering Company. Overall length of the filter is 6⅛ in., with head diameter of 4¼ in., and case diameter of 3⅛ in. Both ends of the filter have 1-in. openings. Filtering media of monel wire cloth is available in mesh sizes from 30 to 100. The cartridge is easily removed for thorough cleaning. *Marvel Engineering Company.*

Save time on hot taps!

Use the all-new

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CH-6

Drilling Machine

Cutting out a section of pipe with the new Mueller CH-6 Drilling Machine prior to stopping-off the line.

Mueller Co. has developed a fast, automatic drilling machine for making cuts from 2″ through 6″ under pressures up to 1440 p.s.i.

The new CH-6 Drilling Machine may be hand operated with a ratchet handle or power operated with the Mueller H-601 Air Motor or H-602 Gasoline Engine Drive Unit. No changes in the machine are required to use either method of operation. And the cutting speed of the "CH-6" is much faster than older machines.

New design and new features reduce set-up and operating time, too. Standardized tools are used with any type of pipe to reduce selection and inventory problems. Total on-the-job time is drastically cut!

Turn the page for full design features on the new CH-6 Drilling Machine.

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. . . a drilling machine designed to reduce your cutting time!

NEW! *self-adjusting boring bar packing*

Spring-loaded, high-temperature chevron packing.

NEW! *rugged all-steel construction*

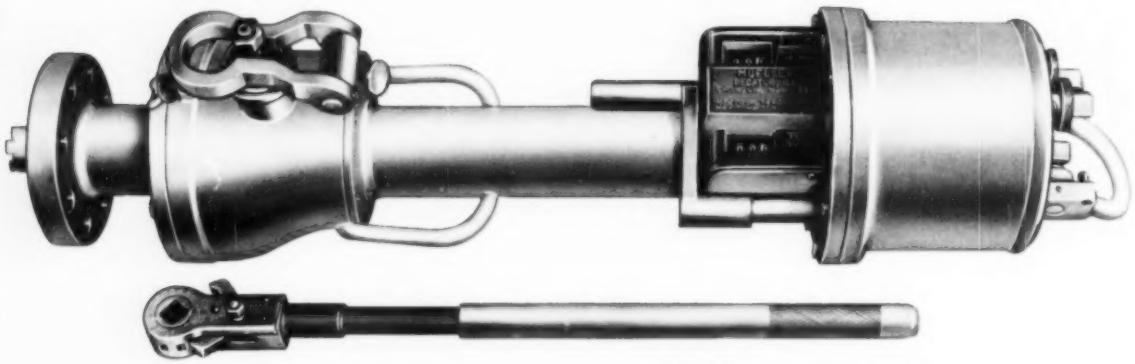
All working parts sealed in oil-filled, galvanized steel case with "O" rings.

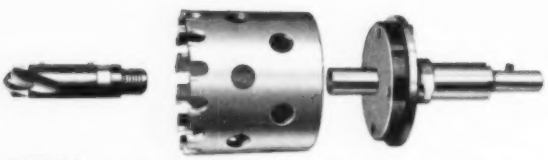
NEW! *power or hand operation*

No changes required to use ratchet handle, air motor or gasoline engine drive unit.

NEW! *handling ease*

Telescopic design and conveniently placed handles and lifting yokes.





NEW! *standardized tools*

Tungsten carbide tipped shell cutters designed to cut any type of pipe. Pilot drills screw into "E-Z-Release" type cutter arbors. Spring-loaded ball detent on pilot drill retains coupon.

NEW! *automatic tool position indicator*

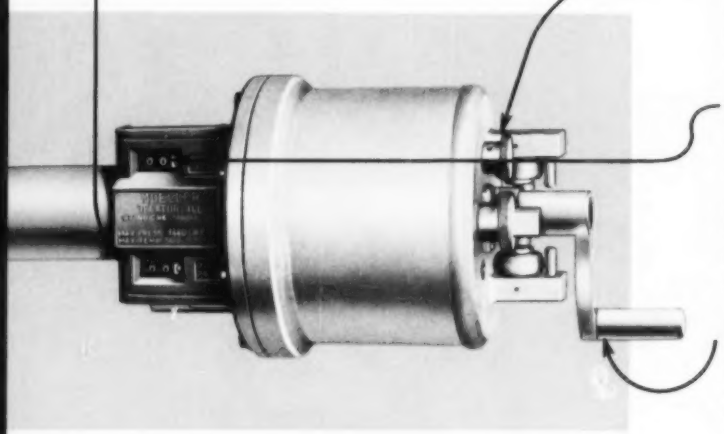
Automatically indicates position of pilot drill and shell cutter at all times. Large numerals read in inches and tenths.

NEW! *automatic overtravel protection*

Tool feed automatically disengaged whenever the maximum 24" travel is reached.

NEW! *automatic feed*

The amount of travel required in automatic feed can be quickly and accurately set in inches and tenths of an inch.



NEW! *automatic feed travel indicator*

Direct-reading indicator automatically shows amount of travel remaining in automatic feed.

NEW! *automatic feed disengagement*

Tool feed automatically disengaged when pre-set feed travel is completed and indicator reads zero.

NEW! *rapid hand travel*

When not cutting, boring bar may be quickly and easily advanced or retracted by hand. Direct shaft for normal pressures. Geared shaft for high pressures.

Check with your Mueller Representative or write direct for complete details.

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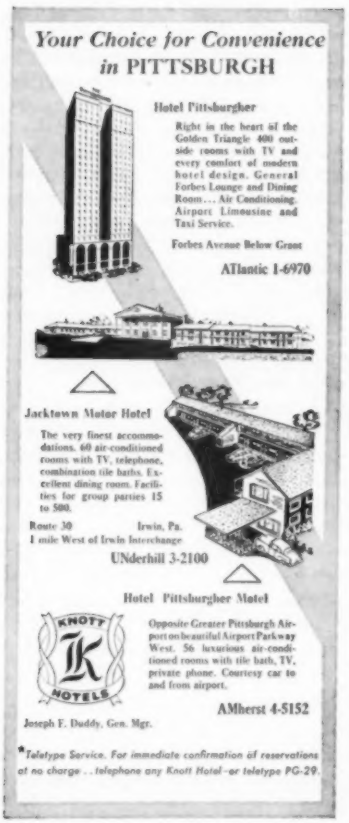
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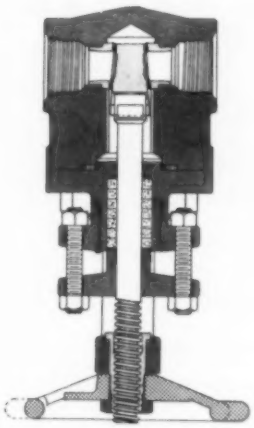
Industrial Engine Line Expanded

229 With the addition of 3 new gasoline engines and 1 six-cylinder diesel, Ford offers a full line of 10 basic industrial engines with displacement ranging from 134 cu in. to 534 cu in. The engine models are the 401, 477, 534 cu in. V-8 gasoline engines and the 330 cu in. diesel. The 3 gasoline engines feature high-turbulance wedge-shape combustion chambers, a fuel induction system and a full-pressure lubrication system.

Brake horsepower of the "534" is 252 at 2800 rpm. For the "477", the brake horsepower is 226 at the same engine speed and the "401" brake horsepower is 185. The "330" has a bore and stroke of 3.94 by 4.52, and a compression ratio of 16 to 1. The dynamometer brake horsepower of the complete engine assembly is 96 at 2250 rpm. *Ford Motor Company.*

Forged Steel Gate Valves

230 A round, bolted-bonnet, bolted-gland gate valve has been added to the Vogt general purpose line of valves for 150 to 800 psi service. They are available with screw ends or socket-weld ends in ¼ in. through 2 in. size. All valves have forged steel bodies. Seats are expanded in the body and are easily renewable. Stellite, or equivalent



hard facing alloys, are welded to the seats of 13 percent chrome stainless steel valves. Other trims are available. The wedges are 13 percent chrome stainless steel, hardened to 500 Brinell to give maximum resistance to wear and erosion.

Stems are 13 percent chrome stainless steel, and the yoke nuts are of special high melting point alloy material for prolonged wear resistance. Stuffing boxes are extra deep and have 1-piece, forged steel packing glands. *Henry Vogt Machine Company.*

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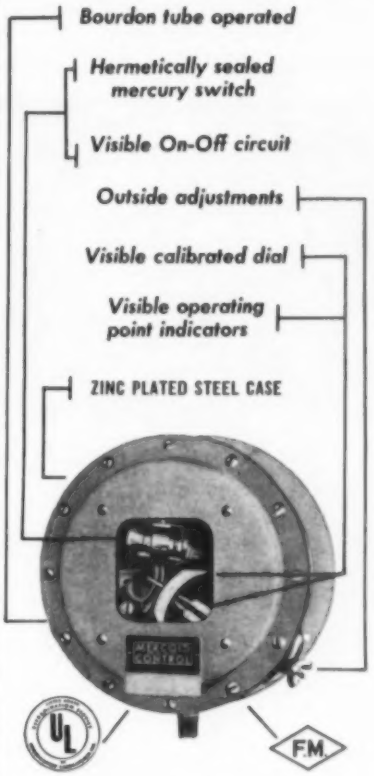
WEATHER PROOF CONTROLS

For PRESSURE - TEMPERATURE



FOR OUTDOOR APPLICATIONS
NEMA 1A, 2, 3, 4

Available in various operating ranges with differentials to meet your requirements.

WRITE FOR BULLETIN 6-18

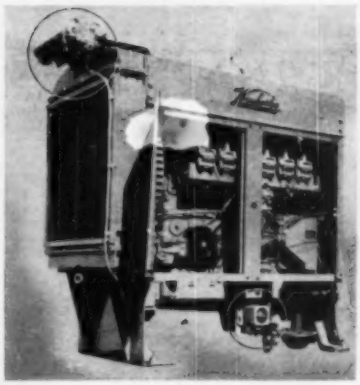
ALL MERCOID CONTROLS INCORPORATE SEALED MERCURY CONTACTS

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILL.

Shortest Truck Tractor Developed

231 Mack Trucks has announced the shortest conventional heavy duty tractor cab arrangement developed in America. It measures only 89 in. from front of bumper to back of cab. The reduced length was accomplished by moving the contour cab forward and allowing the engine to project slightly into the cab. A small reinforced fiberglass cover is fitted over the portion of the engine protruding under the cowl. Removal of the fiberglass cover and 3 small dash sections enables complete access to the rear portion of the engine, permitting major overhaul without removing the engine or cab from the chassis.

Shorter dimension of the tractor, in addition to permitting use of longer trailers, allows loading an extra 300 to 400 lb on the front axle of the tractor. In addition to a wide choice of gasoline or diesel engines, the models also are available with a broad selection of Mack-built transmission, front and rear axles, brakes and optional power steering, and weight-reduced versions. *Mack Trucks, Inc.*



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Profitable operations follow sound process and engineering design. You can benefit from plant modernization or expansions or new production units or new processes. Our staff will be pleased to assist you in working out a program that will assure increased production dollars. Development, engineering and construction of petroleum and chemical plants and processes are major services we can offer you.

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THE C. W. NOFSINGER COMPANY
Engineers and Contractors for the Petroleum and Chemical Industries
307 E. 63rd STREET KANSAS CITY 13, MISSOURI

Automatic Oil and Water Make-Up

232 The Ren exhaust condenser condenses water from the exhaust gases of natural and liquefied petroleum gas engines, providing sufficient water for radiator water make-up requirements. The condenser incorporates a primary purifying stage in which undesirable products of combustion are removed and discarded. The final stage of the condenser provides mineral-free water which is automatically fed to the engine cooling system through a float-check valve as required.

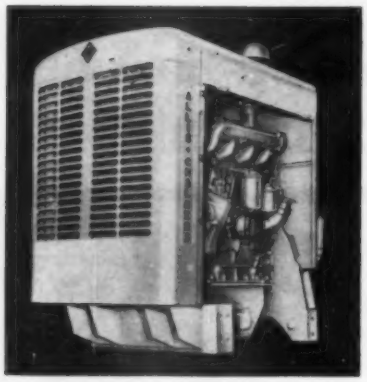
The Ren oil level regulator automatically maintains a constant crankcase oil level from any one of several supply systems of varying capacities. The regulator itself is a rugged float-valve designed for application to crankcases of internal combustion engines, compressor crankcases and lubricators.

The combined use of the oil level regulator and exhaust condenser provides a degree of automatic engine operation heretofore unobtainable in the operation of engines and associated mechanical equipment. This system is described by the manufacturer as "Ren-Automation." *Power Plus, Inc.*

Insulated Unions for Corrosion Protection

233 Installations in areas subject to electrolytic corrosion receive protection when equipped with Weco insulated unions. More than 35 million ohms resistance is provided across the union by special laminated insulating rings and resilient O-ring seal rings. Both seal rings and insulating rings are locked-on to prevent loss during travel or assembly. Rings can be replaced without the use of special tools.

Full circle contact of an O-ring seal on the male sub seats in a conical section of the female sub to give a type of ball-in-a-cone seat and seal. *Well Equipment Manufacturing Corporation.*



New Units Added to Diesel Line

234 Two new diesel power units have been added to the engine line of Allis-Chalmers Manufacturing Company. They are the 88-hp Model D-344, and the 131-hp Model D-516 units. The high-torque engines provide a steady hp output at working speeds from 1000 to 1800 rpm. The D-344 is a 4-cylinder and the D-516 a 6-cylinder engine. Full pressure lubrication and thermostatically controlled cooling systems provide smooth, safe operation.

The engines feature 24-v electrical starter and generator, single plunger type, dust-proof and self-lubricating fuel injection pump, simple pintle-type injection nozzles, 2 large fuel filters, and by-pass type thermostats in the forced circulating type cooling system. *Allis-Chalmers Manufacturing Company.*

Motors Feature Straight-Up Ventilation

235 A new motor announced by Electric Machinery Manufacturing brings ventilating air in through bottom openings and circulates it through the motor, discharging at straight up through the top of the motor. Motor is constructed in a box-type frame which has an advantage in its low silhouette as well as taking up little space. With this ventilation system, there is a minimum of interchange of heated air between motors. The motor operates at 3600 rpm and is available in ratings up through 4000 hp. *Electric Machinery Manufacturing Company.*

Free-Piston Meter Calibrator

236 Calmet is the name of a new line of "free-piston" type meter calibration units offered by Calibration and Metering Company. The units provide a rapid, accurate method for calibration of liquid meters. They are particularly adaptable to LPG or any liquids having a high vapor pressure. and crude oils which tend to encrust on prover tank walls.

Special trailer-mounted units provide certified calibration of meter prover tanks and ACT metering tanks. The company can also provide design engineering for complete calibration and metering systems. *Calibration and Metering Company.*

Closed Circuit Television System

237 General Electric has developed a small, single-unit television camera which operates without separate control power units or bulky cable connections. The camera is available in 3 specific types. Depending on the model, the camera weighs from just over 13 lb to slightly more than 15 lb, and measures 7 13/16 by 12⅜ by 5⅛ in.

The minimum system — exclusive of receiver — consists of camera, coaxial cable and a 1-in. f2.5 lens. It functions well over a range of ambient temperatures from 0 to 50 C and all models will transmit images up to 1000 ft. With available accessories, they can send a picture over distances limited only by transmission facilities. *General Electric.*

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FOR OIL COUNTRY USE

LINE PIPE COUPLINGS A. P. I.
⅛" to 12" — Seamless and Special Processed — Black or Galvanized

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CASING COUPLINGS A. P. I.
4½" to 13⅜" — Long or Short

HYDRAULIC COUPLINGS
⅛" to 4" — Seamless

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WHEELING MACHINE PRODUCTS COMPANY

WHEELING, WEST VIRGINIA

WEST COAST FACTORY: WOODLAKE, CALIFORNIA

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Erie, Pa. — R. J. Maggi, Box 711
Falmouth, Mass. — Walter S. Bennett, 53 Minot St.
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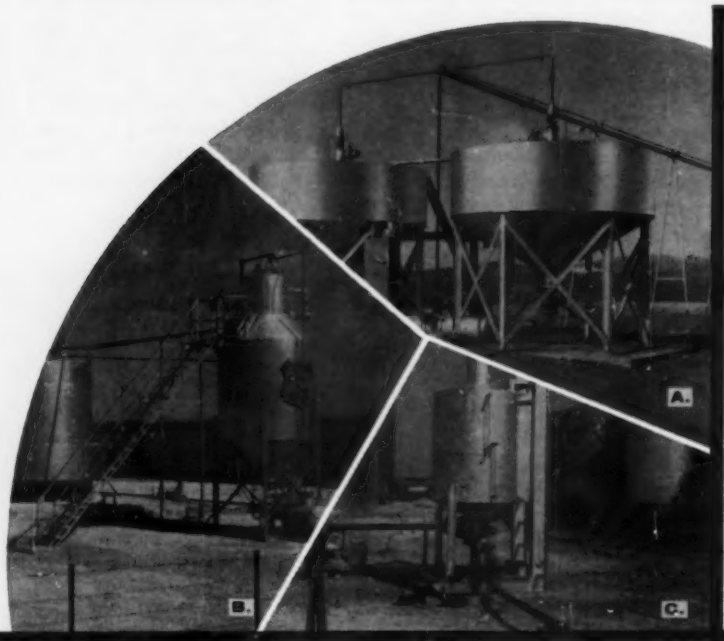
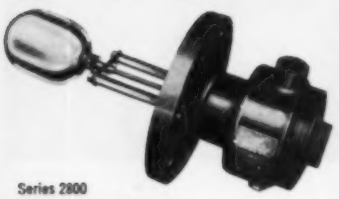
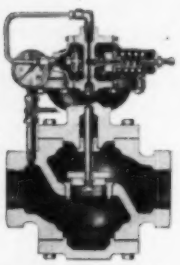
QUALITY-CONTROLLED PIPE COUPLINGS SINCE 1918

Precision accounting for every barrel
FISHER-CSC LACT CONTROLS

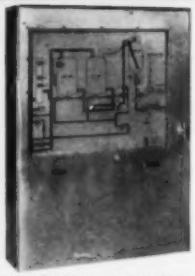




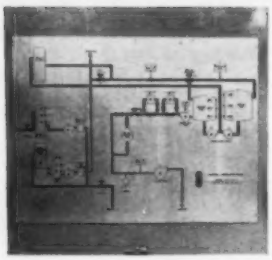
Series 2800
252V Liquid Level Controls



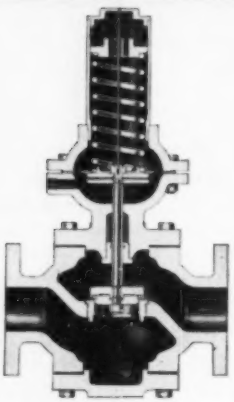
Type 63 Back Pressure Valves



SINGLE TANK SYSTEM PANEL



PD METER SYSTEM PANEL



Type 1563 Control Valves

SHOWN ABOVE ARE THREE TYPES OF LACT INSTALLATIONS IN WEST TEXAS USING FISHER-CSC CONTROLS

A. DUAL METERING TANK SYSTEM
B. SINGLE METERING TANK SYSTEM
C. POSITIVE DISPLACEMENT METERING

Fisher Governor Company and its subsidiary Control Specialty Corporation can handle your control problems regardless of the type of LACT system you are proposing. We invite you to consult with our engineers on control equipment problems related to your particular LACT requirements.

For complete information write Fisher Governor Company or Control Specialty Corporation

FISHER GOVERNOR COMPANY
CONTROL SPECIALTY CORPORATION
(A Subsidiary of FISHER GOVERNOR COMPANY)
Box 4524, Houston 13, Texas
Marshalltown, Iowa / Woodstock, Ontario

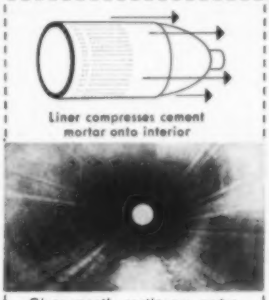
FISHER® Controls
SINCE 1880

New Machining and Boring Plant

238 Diesel Parts & Service, Inc., has established a new plant in Tulsa, Oklahoma, and has installed several new pieces of equipment. The company specializes in heavy machining and boring in the field of diesel engine renewal parts. Specialized equipment available at the plant include a 57-in. lathe with 40-ft centers, a 27-in. by 12 ft lathe, a boring mill with 8-in. bar and 10-ft travel, an 18-in. by 36-in. cylindrical grinder, a 3¾-in. horizontal mill, and a complete machine shop. The company maintains a permanent file of over 32,000 engineering records and drawings for immediate reference. *Diesel Parts & Service, Inc.*

Interchangeable Gasoline And Diesel Engines

239 Hercules Motors Corporation is manufacturing a new series of 3-cylinder gasoline and diesel engines. Cylinder blocks are interchangeable between gasoline and diesel engines of like size, and are so designed that they can be turned end for end and the flywheel housing and gear cover bolted to either end, permitting power to be taken from either end of the engines. It is also possible to change an engine built as a gasoline unit into the diesel type by changing the pistons, cylinder head castings, spark plugs and distributor for fuel injection nozzles and fuel injection pump, the governor arrangement, and the manifold and carburetor on the gasoline engine for the air intake and exhaust manifold on the diesel engine. The diesel, on the other hand, can be changed over to the gasoline engine by reversing the process. *Hercules Motors Corporation.*



Tate Process applies cement mortar lining to the interior of 4" to 16" lines quickly and economically . . . while the lines stay "in place." Permanently restores full flow coefficients. Reduces pumping and maintenance costs. Protects against corrosion, contamination.

Write for full information TODAY!

Specializing in Pipe Protection Problems • Tate and Centriline "In Place" Interior Cement Mortar Lining • "In Plant" and "Railhead" Centrifugal Spinning of Cement Mortar or Coal Tar Linings – Somastic® Exterior Coating • Pipe Wrapping • Reclamation: Removal of Old Wrapping, Straightening, Blasting, Beveling, Testing.

PIPE LININGS
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STICHT
TACHOMETERS
FOR EVERY NEED . . . EVERY SPEED

CENTRIFUGAL HAND TACHOMETERS
Universal Type UO with 5 ranges in one instrument. With overspeed protection.
CAT. NO. 303, 30-12,000 RPM
CAT. NO. 314, 45-18,000 RPM
CAT. NO. 322, 60-24,000 RPM
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Many other models with one, three or five ranges.
BULLETIN 750

CHRONOMETRIC HAND TACHOMETERS
"Jaquet" Speed Indicators with built-in chronometer movement. Timing period 3 or 6 seconds. Guaranteed accuracy 1/2 of 1 per cent. Various accessories.
CAT. NO. 2301, 0-10,000 RPM
CAT. NO. 2302, 0-1,000 RPM
CAT. NO. 2304, 0-100 RPM
Suitable double rated speed.
BULLETIN 735

CENTRIFUGAL STATIONARY TACHOMETERS
For permanent mounting on machines. Model J. Sizes 3 in., 4 in., 5½ in., 8 in. and 10 in. dial diameters. Flexible cable driven. Many standard ranges reading RPM, FPM, YPM, etc. BULLETINS 794, 795, 796

VIBRATING REED TACHOMETERS
PORTABLE AND STATIONARY
Measure speed by touch. Many different ranges from 900-100,000 RPM.
WRITE FOR BULLETIN 770-A

HERMAN H. STICHT CO., INC.
27 PARK PLACE, NEW YORK 7, N.Y.

Supercharged Opposed-Piston Diesel

240 A turbo-supercharged opposed-piston-diesel engine has been announced by Fairbanks, Morse & Company. Supercharging has added 50 percent to the capacity of this 2-cycle diesel, making it available in ratings up to 3600 hp. An added dividend achieved by the turbocharged OP is a 5 to 10 percent saving in fuel consumption. Turbocharging is available in the 6-cylinder and 12-cylinder configurations of the 8⅛ by 10-in. opposed-piston engine. The weight of the 6-cylinder basic engine is approximately 24,900 lb, only 2000 lb more than the non-supercharged engine. The weight of the 12-cylinder unit is approximately 46,200 lb, just 4000 lb more than the corresponding non-supercharged engine. At its top rating of 3600 hp at 900 rpm, the 12-cylinder diesel weighs only 12.8 lb per hp. *Fairbanks, Morse & Company.*

Single-Engine Executive Aircraft

241 Cessna Aircraft Company has announced the addition to its 1958 line of a 4-place, single-engine, all-metal airplane with a 175 hp power-geared engine with new floating cowl suspension. The power plant for the Model 175 is a 6-cylinder, 175-hp geared engine with a 0.75:1 gear ratio. Geared engine has allowed the use of an 84-in. diameter propeller, which has a ground clearance of 12 in.

Maximum speed at sea level is 147 mph. Utilizing 70 percent power at 10,000 ft, the ship will cruise at 139 mph with 4.3 hr endurance and a range of 595 miles. The airplane has a sea level rate of climb of 850 ft per min and a service ceiling of 15,900 ft. Gross weight is 2350 lb, while empty weight is 1312 lb. Fuel capacity is 52 U.S. gal with range based on 43 gal usable. *Cessna Aircraft Company.*

- In Stock for Immediate Delivery
- Certified to AGA and ASME Specifications

Selecting, ordering, and installing Daniel Flangnek Standard Meter Tubes is as easy as falling off a log. All you need to know is:

- SIZE • CATALOG NUMBER • PLATE BORE

No engineering, no designing, no wasted time and effort. Your meter tube can be ordered and shipped before you can set up your drawing board! And this standard design guarantees maximum accuracy — *it's by Daniel!*

*Patented

WRITE FOR METER TUBE CATALOG SECTION "D" AND YOUR FREE DANIEL ORIFICE FLOW CALCULATOR

Daniel ORIFICE FITTING COMPANY
INCORPORATED
9720 Katy Road, Houston 24, Texas • 3352 Union Pacific Ave., Los Angeles 23, Calif.

110

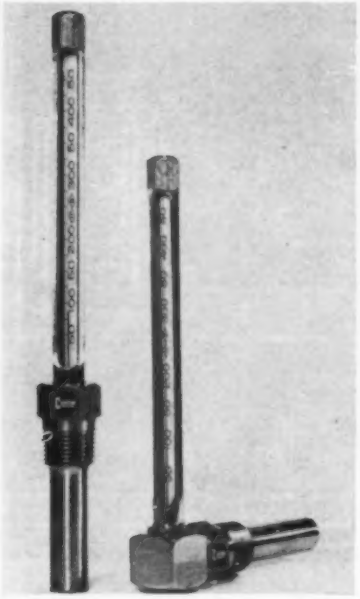
Stainless Steel Needle Valve

242 A new stainless steel needle valve designed for corrosive service and suitable for pressures up to 10,000 psi has been developed by the Jas. P. Marsh Corporation. Packing used is of moulded Teflon and is leak-tight, free from binding, readily replaced, and assures operation in temperature ranges from −100 F to 500 F at working pressures from 1 psi to 10,000 psi.

Valve bodies, valve stem, and guides are machined from solid 416 stainless steel bar stock. The valve stem is machined with fine-pitch threads for fine regulation. Deep chambered threads are machined to extra length permitting under-sized pipe threads to make up tightly. The possibility of restricted flow due to pipe ends coming too close to inlet and outlet ports is eliminated. *Jas. P. Marsh Corporation.*

Rugged Industrial Thermometers

243 Curtin "Yellow-Mite" midget type industrial thermometers are engineered for installations requiring small, accurate thermometers which are amply protected and rugged enough to withstand severe service. Their high physical strength, sensitivity, and versatility in mounting make them suited



for installation in product pipe lines, tanks, power plants, etc.

The thermometers are available in 2 styles, the "straight" and the "angle," covering the range from −30 to 700 F. Length of well below threads is available in either 2, 4, or 6 in. and in all ranges. The well is stainless steel and the armor is made of chromium plated, heavy brass. *W. H. Curtin & Company.*

Air Clutch Line Expanded

244 Production of new 8, 10, and 11½-in. size air clutches has been announced by Twin Disc Clutch Company. The models are suited for oilfield equipment and machinery where high torque capacity and long life are a requirement. They are available in triple-plate, double-plate and single-plate construction and have a maximum torque capacity of 3503 lb-ft. A feature of these new air clutches is their cartridge-type diaphragm. This diaphragm is constructed of neoprene reinforced with nylon and its design is such that leakage is eliminated.

The clutches are compact and have narrow widths that permit their replacing drum or band clutches. They are of heavy-duty construction and feature a clutch mass properly distributed relative to friction area, providing long life on high energy loads. They are suitable for air systems up to 130 psi. *Twin Disc Clutch Company.*

High-Pressure Vane Pump

245 A new series of balanced vane hydraulic pumps for continuous 2000 psi service has been announced by Denison Engineering. Pumps are rated up to 100 gal per min at speeds up to 1800 rpm. The pump is available with either clockwise or counter clockwise shaft rotation.

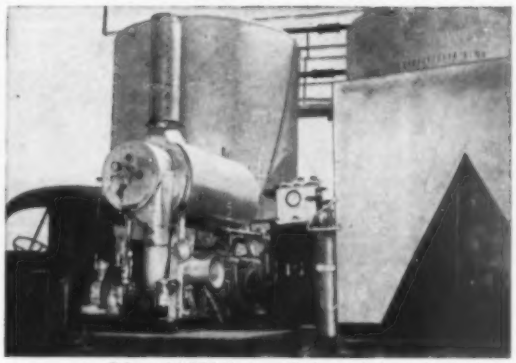
The pump consists of a housing which provides an outlet connection, a bore for support of the shaft bearing and shaft assembly and a larger bore which contains the floating pumping cartridge consisting of a front port plate, vane, rotor and cam ring assembly and rear port plate with a shaft end support bearing. By providing maximum shaft support, the bearings permit use in applications with higher shaft side loading. *Denison Engineering Division, American Brake Shoe Company.*

Versatile

WISCONSIN-POWERED

"Texheater"

gets around in the Oil Fields



This model 25M Texsteam Texheater is in service in the Sherman, Texas, pool. It is manufactured by The Texsteam Corporation, Houston, Texas.

WIDELY used in the oil fields, this versatile heating unit has many applications . . . where quick, sustained heat is required. It is extensively employed to heat oil that is emulsified with water so that the added chemical will be immediately effective. It is also used for heating oil that has a tendency to deposit amorphous paraffin and thus clog up pipelines and connections.

A V-type 4-cylinder Wisconsin Heavy-Duty Air-Cooled Engine provides the dependable power required for operating the compressor that atomizes the fuel oil for heating, as well as circulating the oil or fluid that is being heated or treated. The Texsteam Texheater shown above has a capacity of 2,500,000 B.T.U. per hour and a discharge temperature of 500° F. if required.

A prime requisite for the successful, sustained operation of this unit is, of course, dependable power. A 4-cylinder V-type Wisconsin Heavy-Duty Air-Cooled Engine was specified as original equipment because this engine meets all oil field requirements. Heavy-duty design and construction in all details provides assurance of low cost maintenance, dependable operation and long engine life. Basic High Torque design supplies the load-holding Lugging Power that rides through the shock loads without stalling. Efficient AIR-COOLING at all temperatures from sub-zero to 140° F. eliminates cooling problems and hazards under all weather conditions.

The Wisconsin Engine line includes a complete range of sizes from 3 to 56 hp., in 4-cycle single cylinder, 2- and 4-cylinder models. *All models can be supplied with electric starting.*

You can't do better than to specify "WISCONSIN POWER" for your equipment.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
3420 McKINNEY AVENUE • HOUSTON, TEXAS
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OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

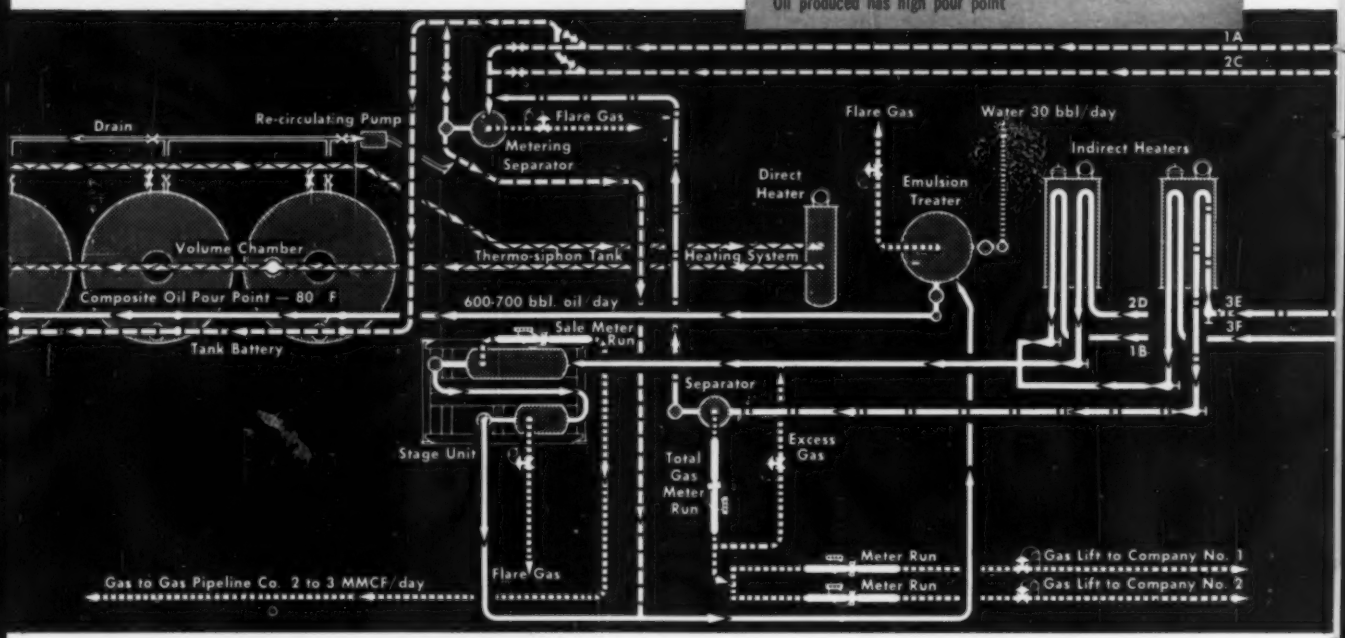
A8-6205-½I

HOW TO PRODUCE 3-Dual Completed Wells

Problem: THREE DUAL COMPLETED WELLS

Well No. 1	Zone A—Gas Sand—8900′ Zone—500 PSI Flowing Zone B—Foaming-Congealing Oil—11,500′ Zone —3500 PSI Flowing
Well No. 2	Zone C—Gas Sand—8900′ Zone—Gas Lift Zone D—Foaming-Congealing Oil—11,500′ Zone —4000 PSI Flowing
Well No. 3	Zone E—Distillate—5500 PSI Flowing Zone F—Foaming-Congealing Oil—11,500′ Zone —5000 PSI Flowing

Oil produced has high pour point



Solution:

Foaming-congealing oil from three zones is preheated in indirect heaters prior to separation in the special Monotube® stage separation unit. Separated dry gas is sold direct to pipeline.

Production from the two gas sands is separated in the metering separator, metered and commingled with oil production prior to treating in emulsion treater.

Each storage tank contains a set of vertical coils used as heat exchangers. Hot water is circulated thermosiphonically between water bath of direct fired heater and tank coils, to prevent high pour point oil from congealing. Gas from the distillate zone is used to gas-lift adjacent leases. The entire production arrangement is so complete and efficient, the pumper's time is held to a minimum.

Surface Equipment Includes:

● 5—Hi 500 Bbl. Bolted Galv. Cone Bottom Tanks w/Thermo-Siphon Vertical Heating Coils ● 2—4′ x 10′ 2xx4-14Y Indirect Heaters ● 1—6′ XCP Emulsion Treater ● 1—2′ x 10′ Direct Fired Horizontal Heater ● 1—30″ x 10′ 3MDF-1030-15x Defoaming Stage Separation Skid Mounted Unit ● 1—2′ x 6′ 10N, 1000 PSI W. P. Separator ● 1—30″ x 10′ 125 PSI W. P. Metering Separator

All equipment in this installation designed, manufactured, serviced and guaranteed by National.

It's a National®

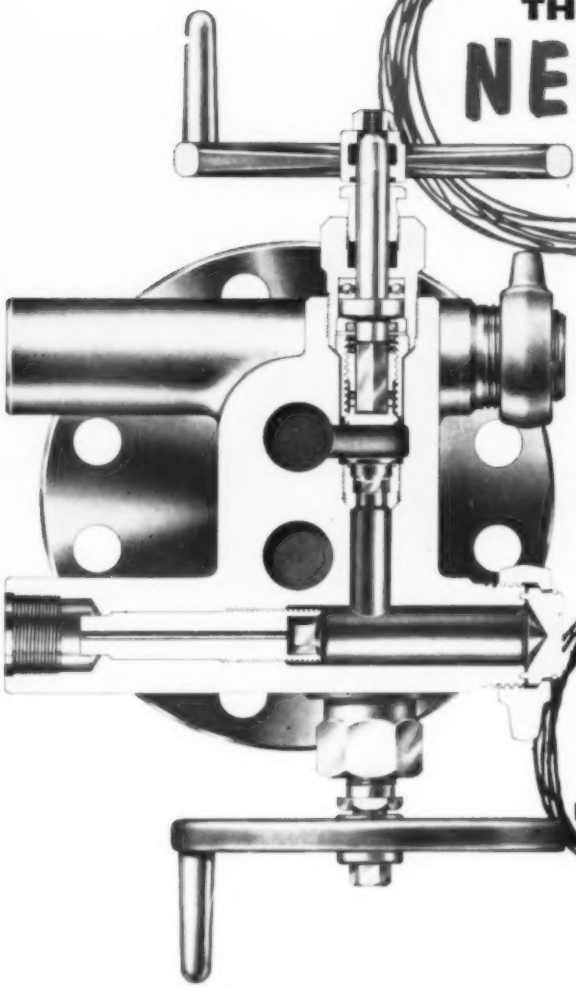
NATIONAL TANK COMPANY

TULSA, OKLAHOMA

THE NEW O·C·T DUAL PORT FLOW CONTROL

35% LESS COST

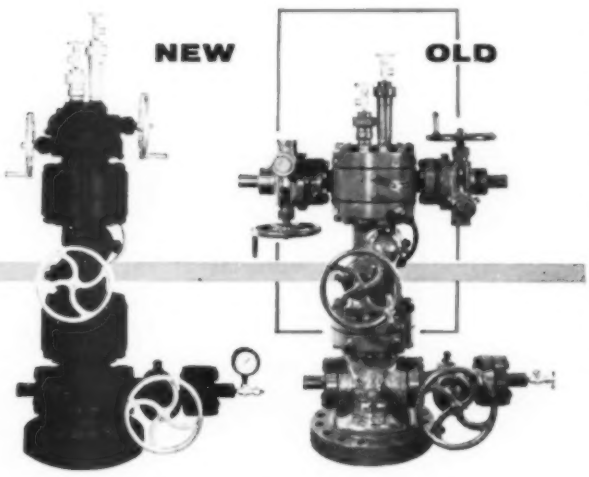
50% LESS WEIGHT



Numerous advantages are inherent in the simplicity, economy and efficiency of the O-C-T Dual Port Flow Control.

• Cost savings of 35 per cent over conventional wing model. • Weight savings of 50 per cent over conventional wing model. • Compactness. • Minimum of connections. • Leak-proof operation. • Bottom hole test adapter connections provided. • Single flow control advantages maintained. • Standard parts interchangeable with O-C-T single flow controls.

• Ask your O-C-T Representative or write for complete information.



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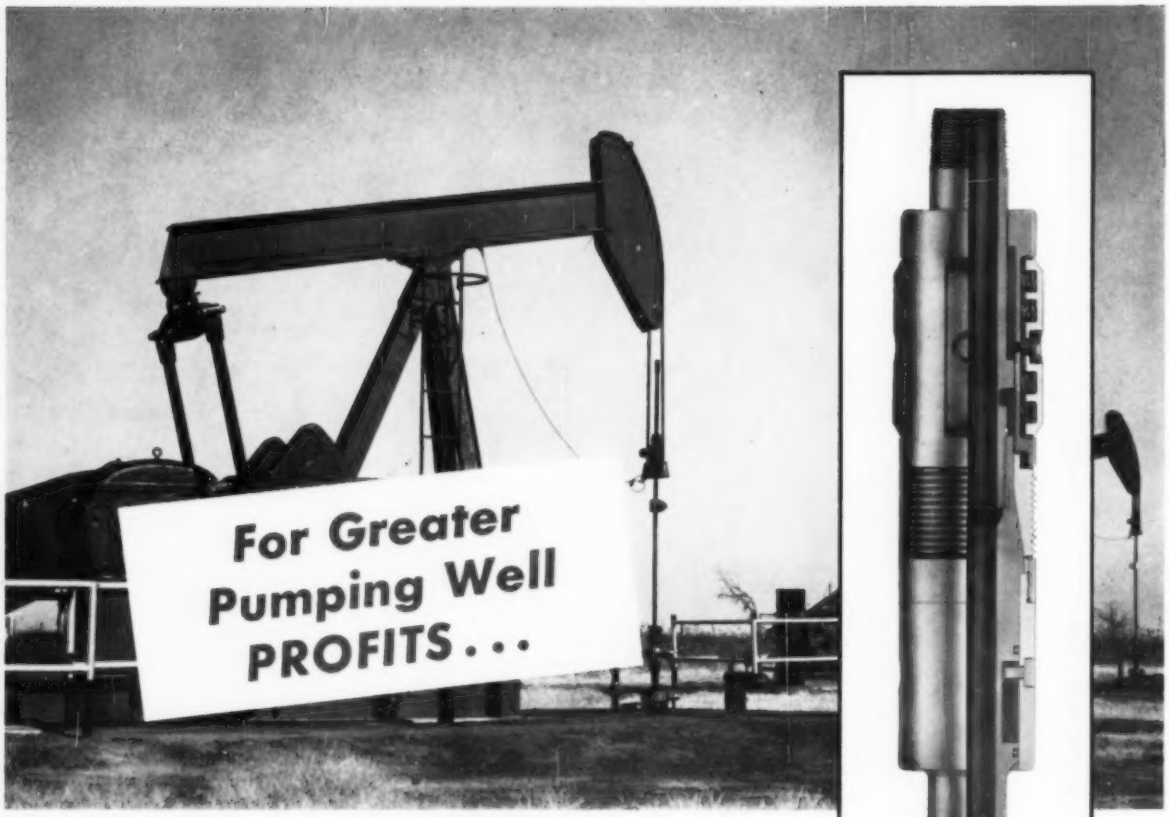
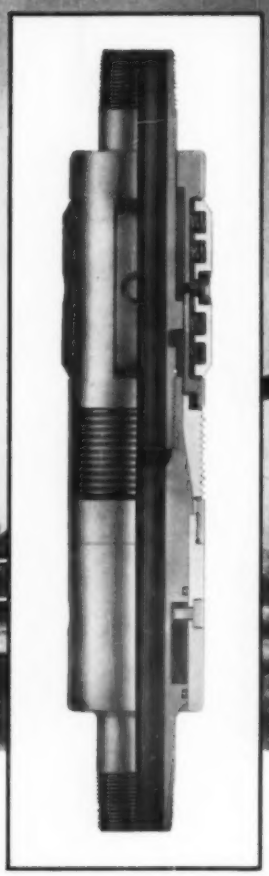
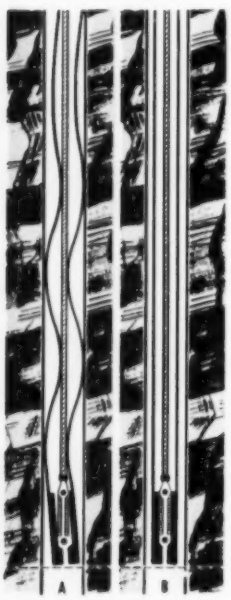




New American Iron Tension Tubing Anchor prevents costly sucker rod and tubing failures!



(A) FREELY SUSPENDED TUBING buckles on the upstroke and (B) straightens on the downstroke.

IN PUMPING WELLS, the costly buckling, breathing and cork-screwing of tubing can now be prevented *by keeping pumping strings in tension* with the American Iron Tension Tubing Anchor. Once this tubing anchor is set, all movement of the tubing, either upward or downward, is eliminated!

Your pumping-wells become more profitable because the money-saving advantages of the new American Iron Tension Tubing Anchor are MANY!

- Increases service-life of rods and tubing!
- Increases fatigue-life of tubing!
- Increases efficiency of the pump!
- Decreases tubing connection wear!
- Decreases rod-on-tubing wear!
- Decreases horsepower input requirements!
- May be used as Automatic Tension Tubing Anchor . . . Positive Tension Tubing Anchor!

COMPLETELY RETRIEVABLE UNDER ALL CONDITIONS

Under normal conditions, just re-jay and pull. Tubing anchor will retrieve easily. Under adverse conditions, a steady upward pull on the tubing will cause a tensile failure of the relief groove in the slip mandrel extension. The upper portion of the slip mandrel extension then becomes a jar that strikes the inside shoulder at the upper end of the housing. The slips are pulled away from the cone and the tool can be retrieved.

Contact your Supply Store now

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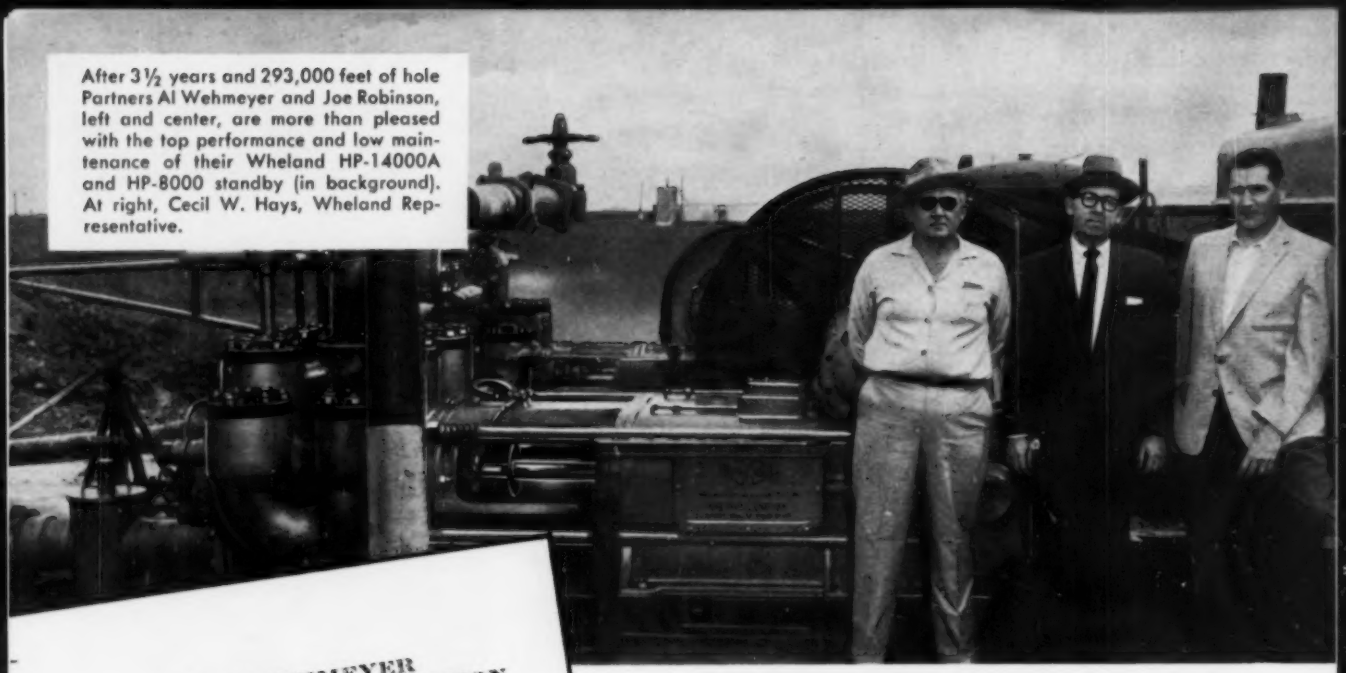

After 3½ years and 293,000 feet of hole Partners Al Wehmeyer and Joe Robinson, left and center, are more than pleased with the top performance and low maintenance of their Wheland HP-14000A and HP-8000 standby (in background). At right, Cecil W. Hays, Wheland Representative.

ROBINSON-WEHMEYER
DRILLING & EXPLORATION

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March 31, 1958

Mr. Gordon P. Street, Pres.
The Wheland Company
Signal Mountain Road
Chattanooga, Tennessee

Dear Mr. Street:

During the past 3-1/2 years our Wheland HP-14000A pump and Wheland HP-8000 standby have made some 293,000 feet of hole. Service and repair expense have been nominal and we are more than pleased with these pumps.

Our operations are in the Texas Gulf Coast area. We drill in depths from 3,000 to 6,000 feet on contract, interest deals and for our own account and we can always depend on our Wheland pumps for a good job under all drilling conditions.

Very truly yours,

Joe Robinson

Joe Robinson

WHELAND

DUPLEX SLUSH PUMPS

Always do a Good Job!

"...can always depend on our Wheland pumps for a good job under all drilling conditions."
—Mr. Joe Robinson

HP-14000—7½" x 14", 350 HP Nominal Input at 60 RPM. Discharge Pressure with 7½" liner 838 PSI; with 5½" liner, 1627 PSI.

HP-8000—7¼" x 12", 220 HP Nominal Input at 70 RPM. Biggest little pump on the market!

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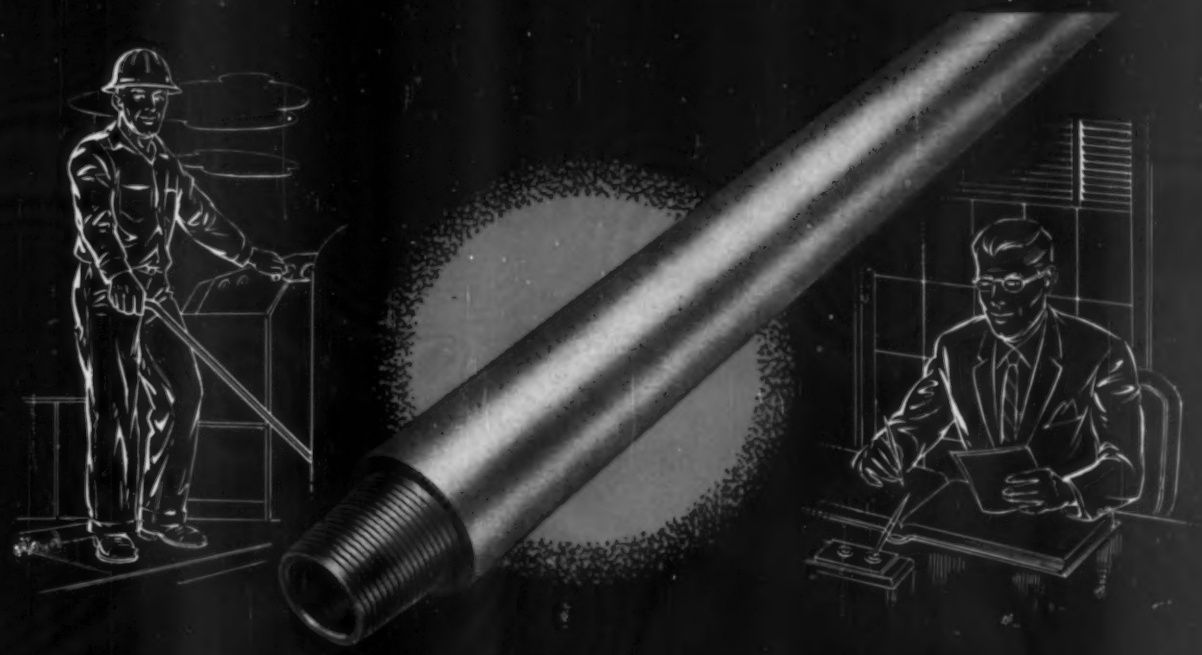

your driller and your accountant....
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- Your cost accountant likes the **savings** shown by the consistent long service life of Baash-Ross drill collars, while your driller appreciates the extra margin of safety and dependability in Baash-Ross collars that keeps his string "turning to the right."

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- Add to your drilling profits, order your next drill collar string from Baash-Ross. You will find Baash-Ross representatives in every oil producing area in the free world.

BAASH-ROSS Lifting Type Thread Protectors positively protect drill collar threads and shoulders while in storage or transit and the strong built-in bail with the rounded "glide" greatly simplifies drill collar handling at the rig. Box and pin units screw together for convenient storage.

For full information see Composite Catalog or write Dept. C-715, P.O. Box 1348, Houston 1, Texas.

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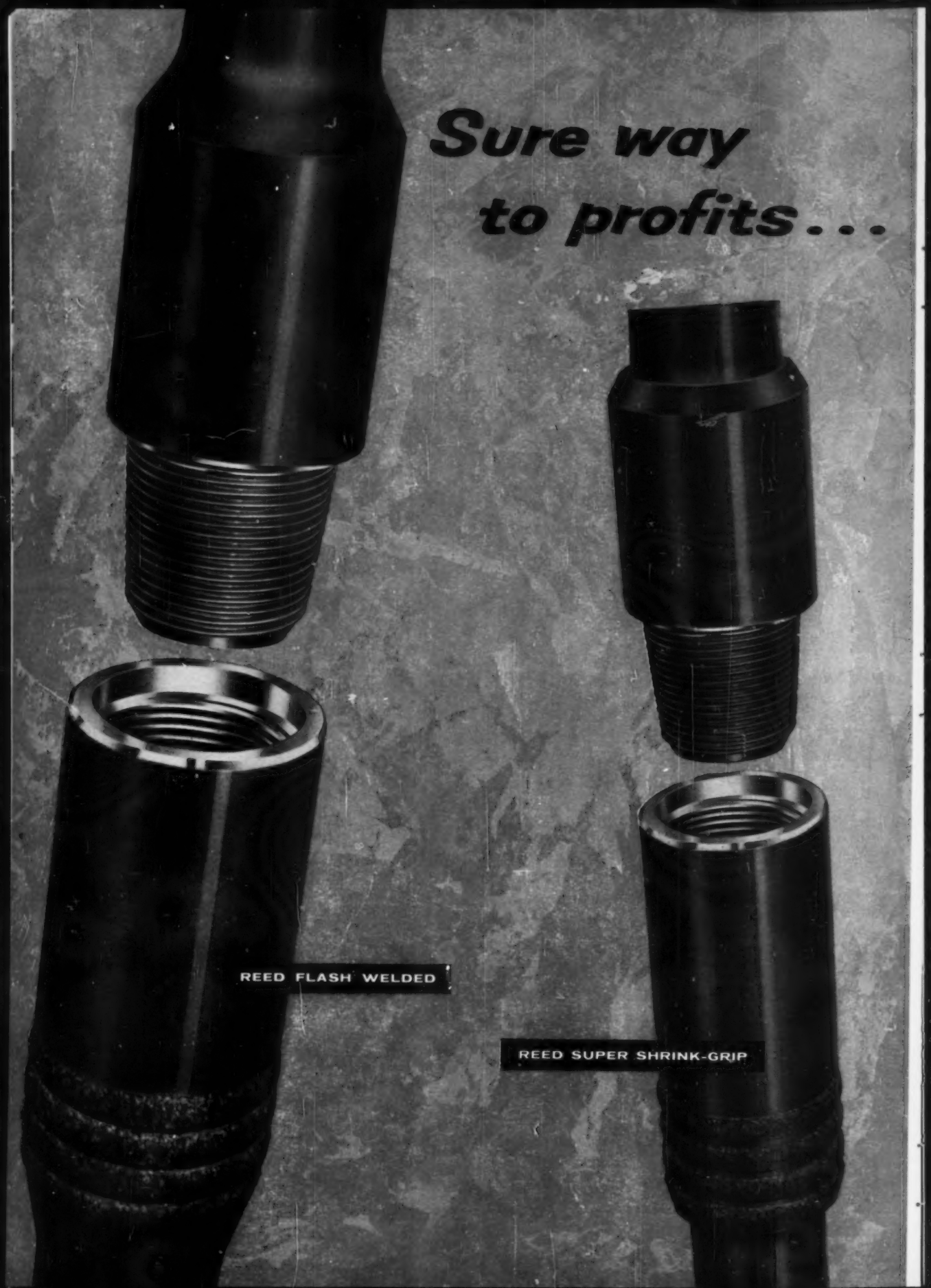
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Renew your drill string now with Reed Tool Joints

A contractor said recently that a seven-day fishing job wiped out a year's profit for one of his rigs. Cause of the fishing job—"Tool joint failure. I knew they were too thin."

You can stay out of such costly trouble by renewing your drill string now with Reed tool joints. Reed experience and skill in development and manufacture of flash welded and field-replaceable Super Shrink-Grip Tool Joints assure the toughest, longest wearing tool joints you can buy.

Why lose a year's profit fishing . . . call your Reed Representative today and have him explain the engineered economies of Reed Tool Joints.

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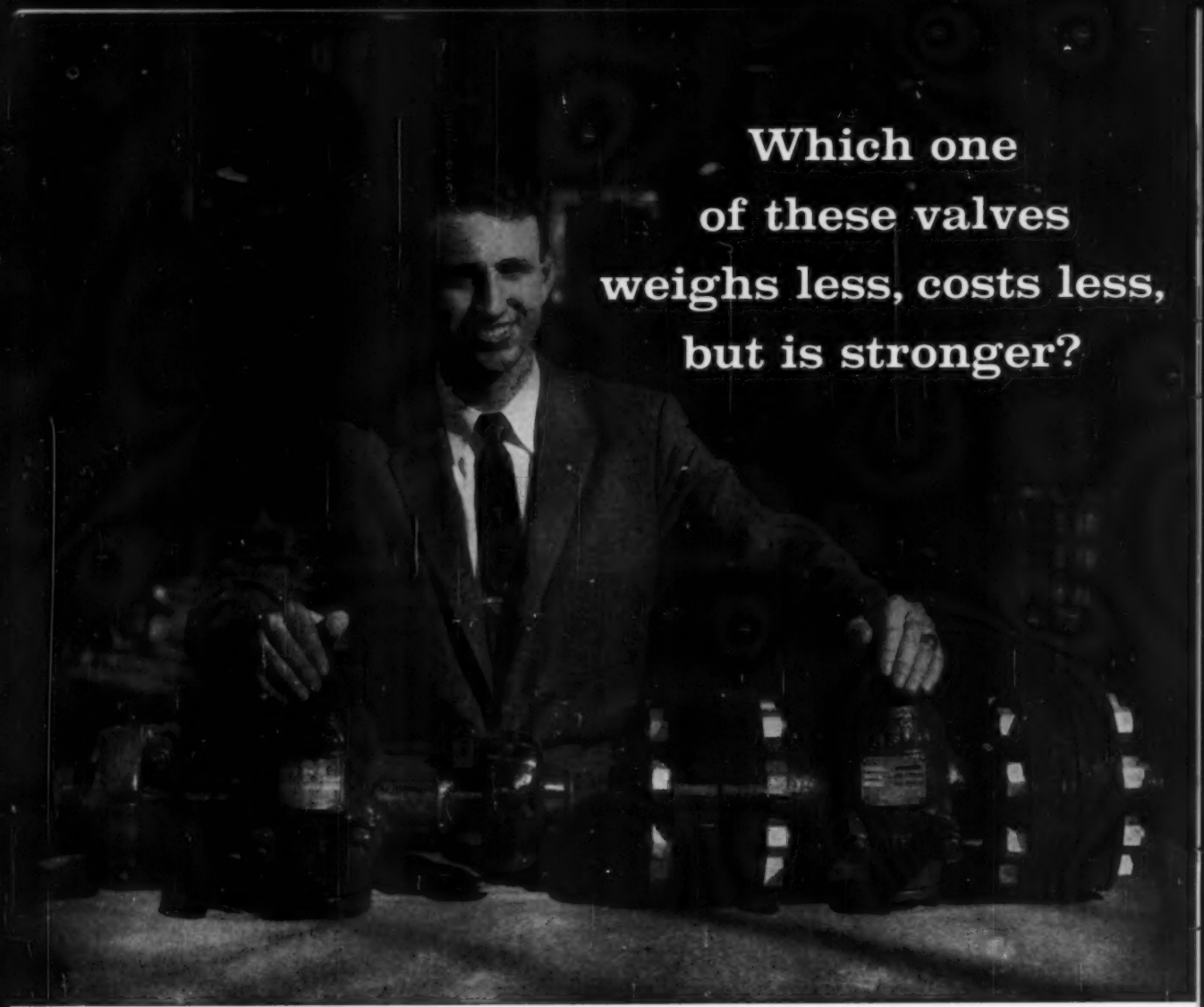

Which one of these valves weighs less, costs less, but is stronger?

Both of these valves are of the same make, model, size, and pressure rating. One is equipped with 2″, 6000 lbs. test, Unibolt Couplings, the other with 2″, Series 900 flanges. The Unibolt-equipped valve weighs 102 lbs. less, costs about 10% less, and is approximately 28% stronger!

And the advantages don't stop there. Because it weighs less, the Unibolt-equipped valve costs less to ship and is easier to handle, easier to install. (Two bolts and nuts, compared to 16 bolts and 32 nuts.)

Unibolt Couplings are easy to attach to any valve. Either hub of the Coupling may be butt-welded, socket-welded or screwed to the valve body.

Even if steel were plentiful, Unibolt-equipped valves—as opposed to flanged valves—would be your best buy.

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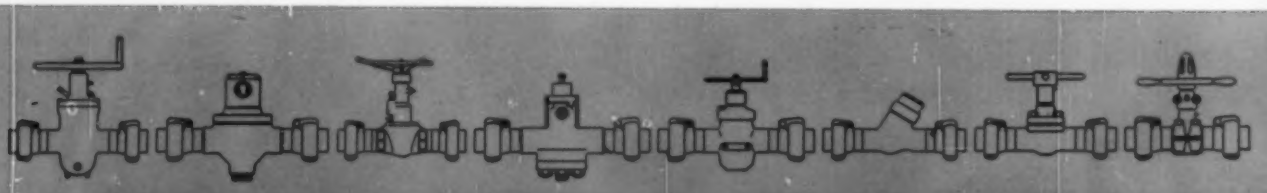

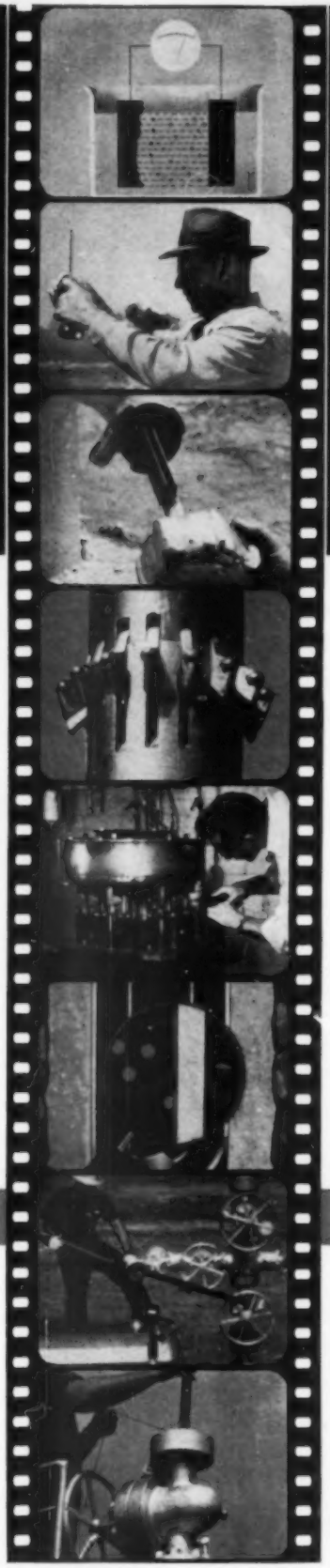

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An instructive film, "OIL and GAS WELL CORROSION," is made available to oil companies, schools, and other organizations at no charge. The film was prepared by the Petroleum Extension Division of the University of Texas. It is a 28-minute, 16mm color film, with sound.

Shows:
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TORQUE IS IMPORTANT

Here's What The Experts Say About Tong Torque

—IMPROPER MAKE-UP IS THE CHIEF CAUSE OF TOOL JOINT FAILURE

—THE BEST METHOD OF ASSURING PROPER MAKE-UP IS WITH A TORQUE GAUGE

MARTIN-DECKER TONG TORQUE GAUGE

Claude L. Griffin
Vice-President, American Iron & Machine Works, Inc.

It is my opinion the major cause of tool joint failure is due to improper make-up torques. The best measure of assuring proper make-up torque is to use a tong torque indicator.

Wiley B. Noble
Vice-President Engineering, Reed Roller Bit Co.

The major cause of tool joint failure is improper torque. To my mind there is only one way to assure proper make-up and that is to use some sort of torque measuring device. The method employing a Martin-Decker Tong Torque Gauge seems to be the only straight-forward engineering approach to the problem.

- **CAN BE USED FOR ANY SIZE TOOL JOINT, CASING OR TUBING**
- **IS ACCURATE, NOT JUST A ROUGH ESTIMATE**
- **IS RUGGED AND DEPENDABLE**
- **CAN BE PERMANENTLY INSTALLED SO THE SIGNAL IS ALWAYS AVAILABLE**
- **CAN BE USED AS A PORTABLE INSTRUMENT FOR SPOT CHECKS**
- **ENGLISH OR METRIC DIALS AVAILABLE**

Stanley C. Moore
President, Drilco Oil Tools, Inc.

In my opinion, the great majority of all failures of rotary shouldered connection are the result of incorrect make-up torque.

We have made a great number of actual checks on the accuracy of estimated torque. We found values ranged from 25% to 160% of the recommended torque. The only way to assure make-up torque is by actual measurement.

Walter B. Reinhold
Sales Manager, Abegg & Reinhold

There can be little doubt that improper make-up is probably the most important single factor resulting in tool joint damage. Undoubtedly the best method of assuring proper make-up torque would be with a tong torque indicator.

TWO METHODS OF INSTALLATION AVAILABLE

The permanent installation of the Martin-Decker tong torque assembly is preferred by the drilling crew that desires tool joint make-up torque *each* time the drill collars are run with no special or extra installations necessary. This also allows the driller to check the make-up torque of the drill pipe as long as backup tongs are in use. Under certain conditions even the measurement of the breakout torque is available. During all measurements the gauge is conveniently mounted in front of the driller, easily visible at all times.

To make the permanent panel mount installation the gauge is placed in the Martin-Decker Weight Indicator box and 25 ft. of hose is extended to the hydraulic cylinder which is secured to the backup post or derrick leg. The backup line is permanently secured to the cylinder and will indicate a torque reading each time the backup line is in use.

The portable installation of the Martin-Decker rotary tong torque assembly is applicable when the instrument is used for intermittent use or for spot checks. In this installation the same instrument can be used for regular checks of the automatic cathead on two or more rigs in an area. It also provides a quick and easy check when running special collars or drill pipe.

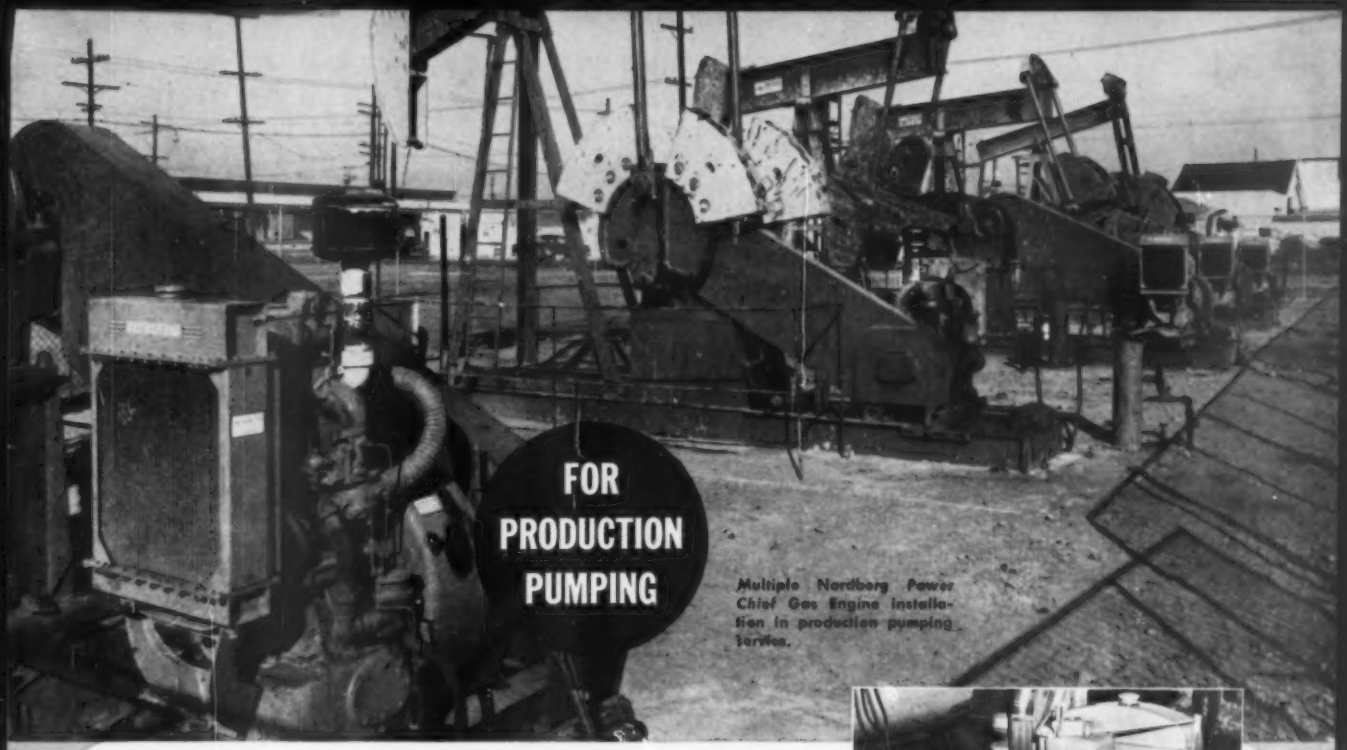
The portable assembly consists of an indicating gauge with a bracket for tong handle mounting. A short cord connects the gauge to the hydraulic cylinder installed on the tong where the make-up line is attached. This instrument can be put into operation in a few minutes and will give a positive and accurate indication of the torque on any size tool joint. The most popular use of this assembly is on power tongs. In this case the Martin-Decker instrument is permanently mounted on the tongs and models are available for direct foot-pounds readings.

The experts all agree that make-up torque is important. Either the portable or permanent installation of the Martin-Decker tong torque assembly will provide the necessary information for more efficient rig operation.

WRITE FOR DESCRIPTIVE LITERATURE

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA



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Here are some of the features that make *Power Chief* engines your *Best Buy:*

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Power Chief Gas Engines in 1 and 2-cylinder models deliver up to 36 hp maximum rating. *Power Chief* Diesel Generator Sets produce 6 to 30 kw for continuous service. All are available with special vibration-proof mounting. NORDBERG MFG. CO., Milwaukee, Wisconsin

Typical rig-mounted Power Chief Diesel Generator Set for lighting service.

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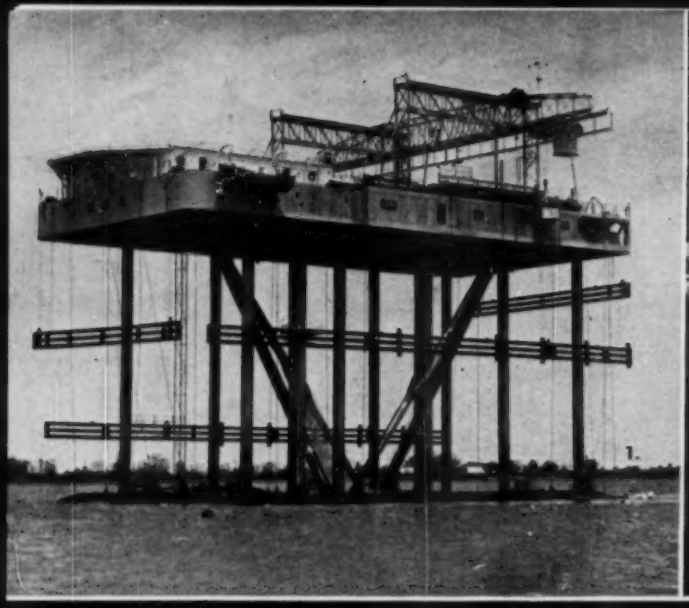
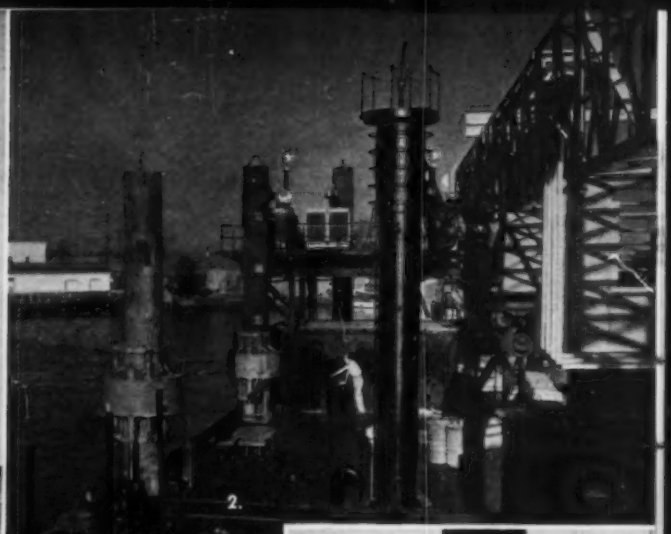
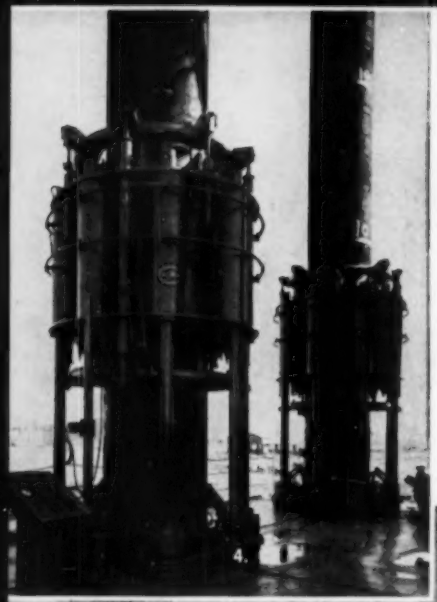




Big Barge Spud Jacks



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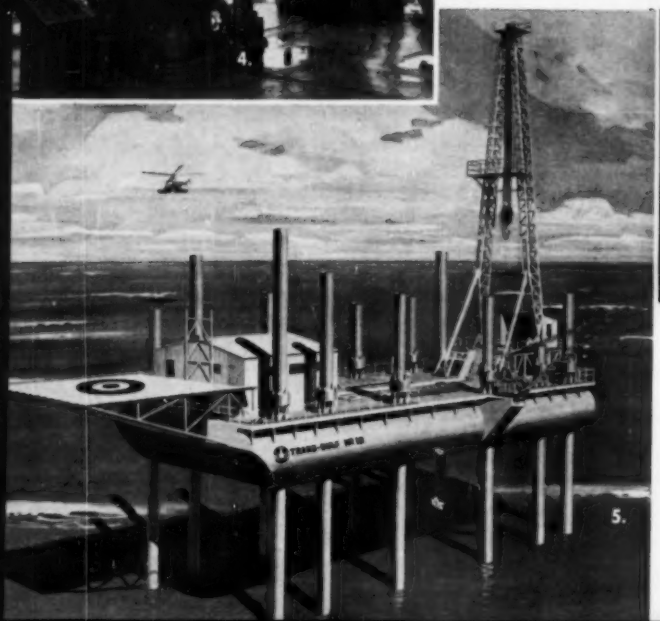

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5. Artist's drawing—elevated deck barge.
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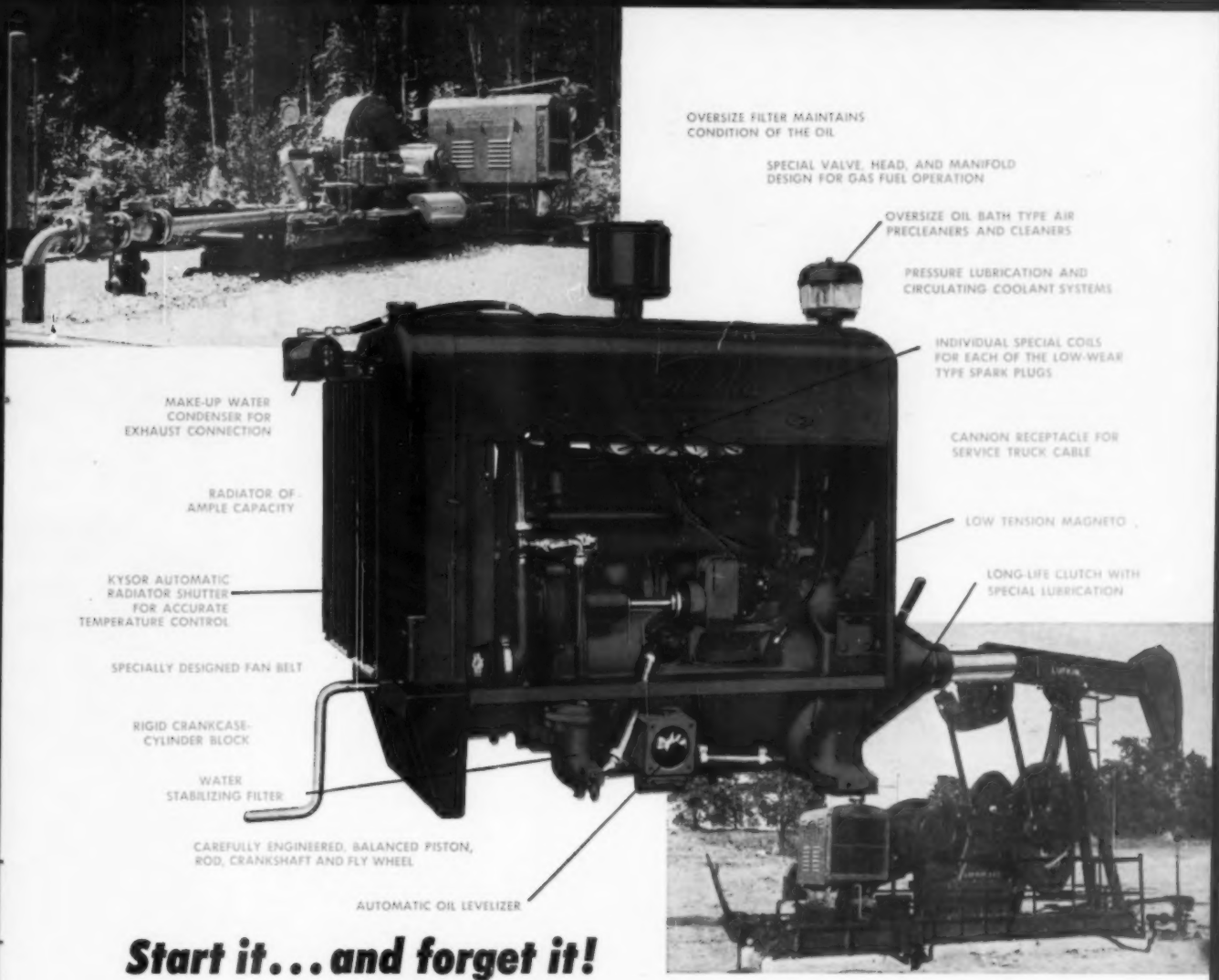
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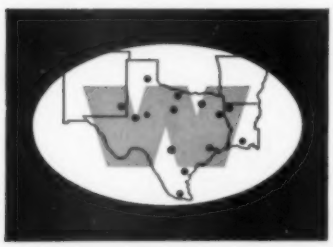
So dependable is this engine that routine inspections can safely be cut to once a month or less. In well-developed fields, this dependability is important, but *in remote or unattended operations* it is essential.

The Long Life Waukesha has all the ruggedness and reliability of the standard Waukesha Gas Engine, plus over twenty heavy duty features. It is designed to *cut overall costs* in production pumping, field gathering, gas compressor and similar service.

Waukesha Sales & Service, Inc. backs the Long Life Unit with *one year's warranty* and with a service organization that's second to none.

Get the facts from your local Waukesha Sales & Service man today. He's listed in the Yellow Pages of your telephone directory.



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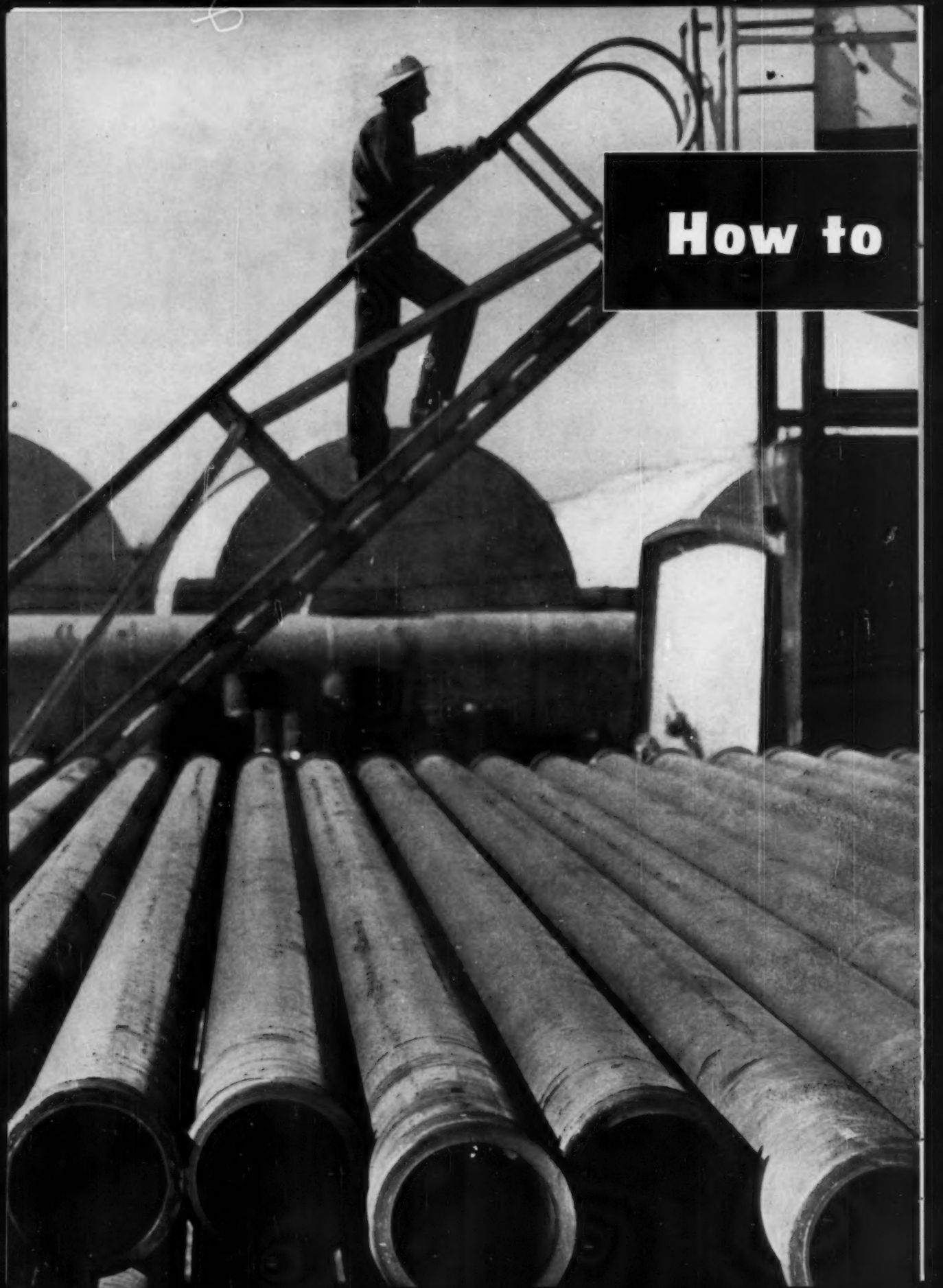
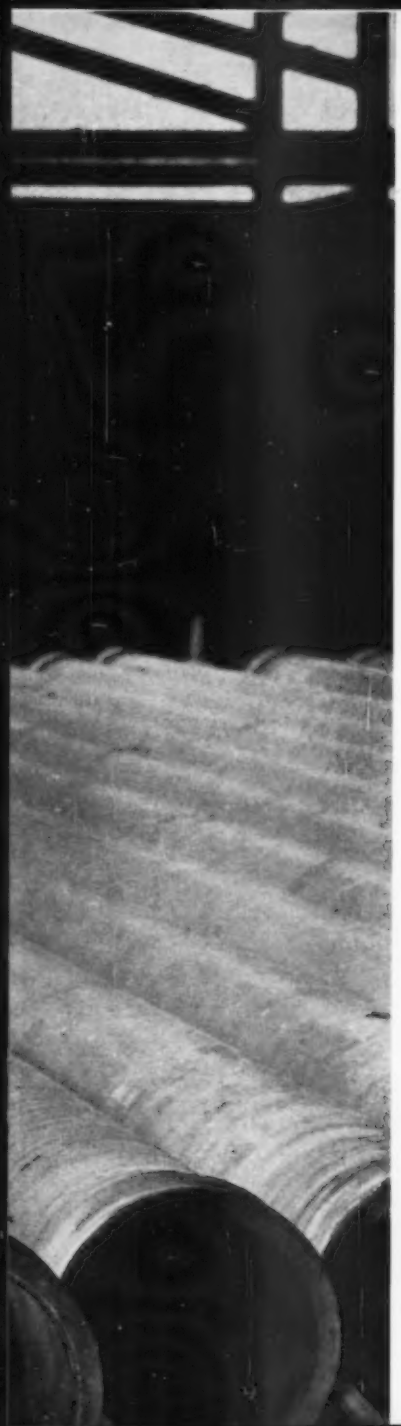

How to

Get Strength on the q. t.



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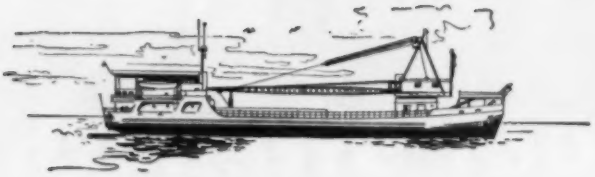
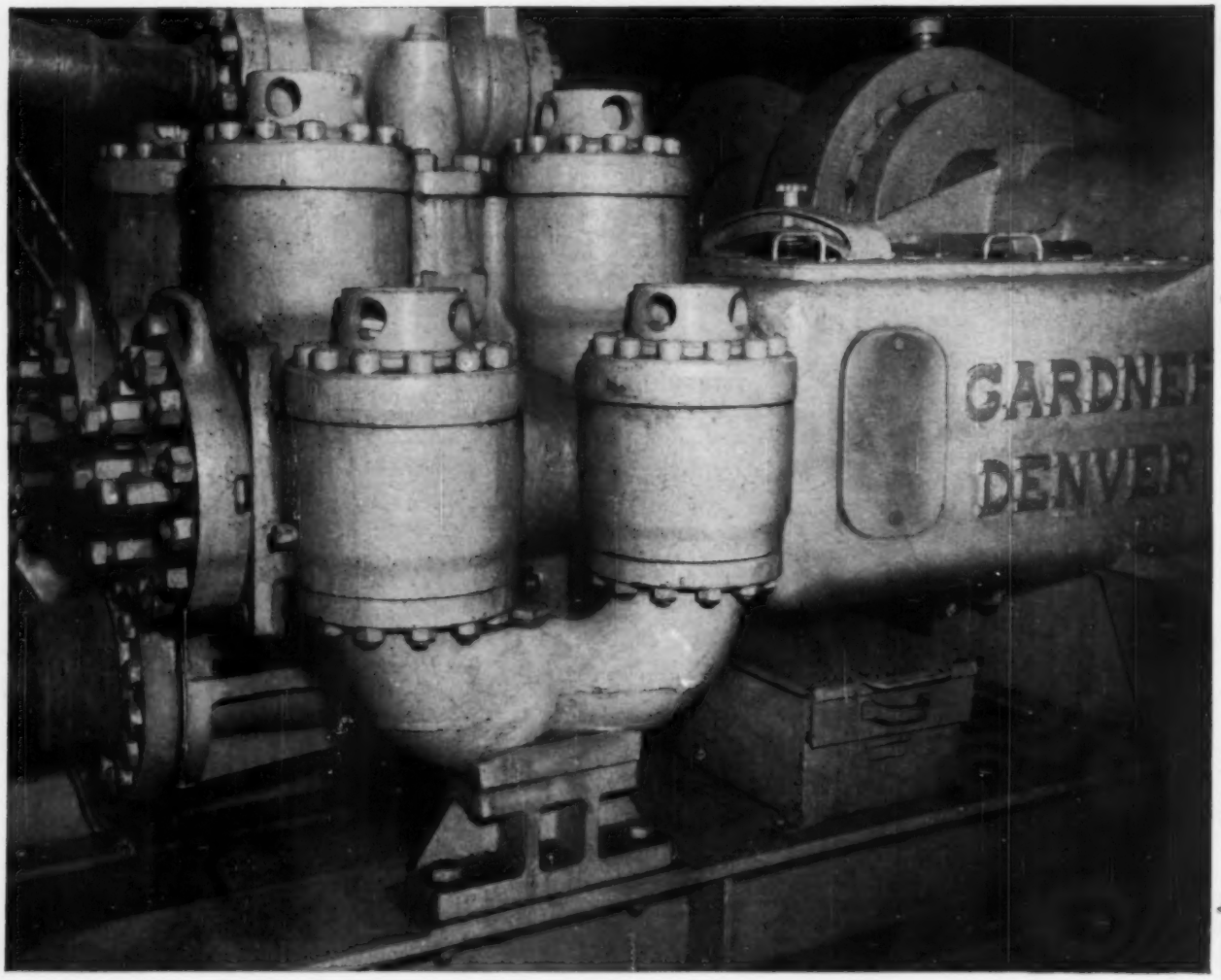
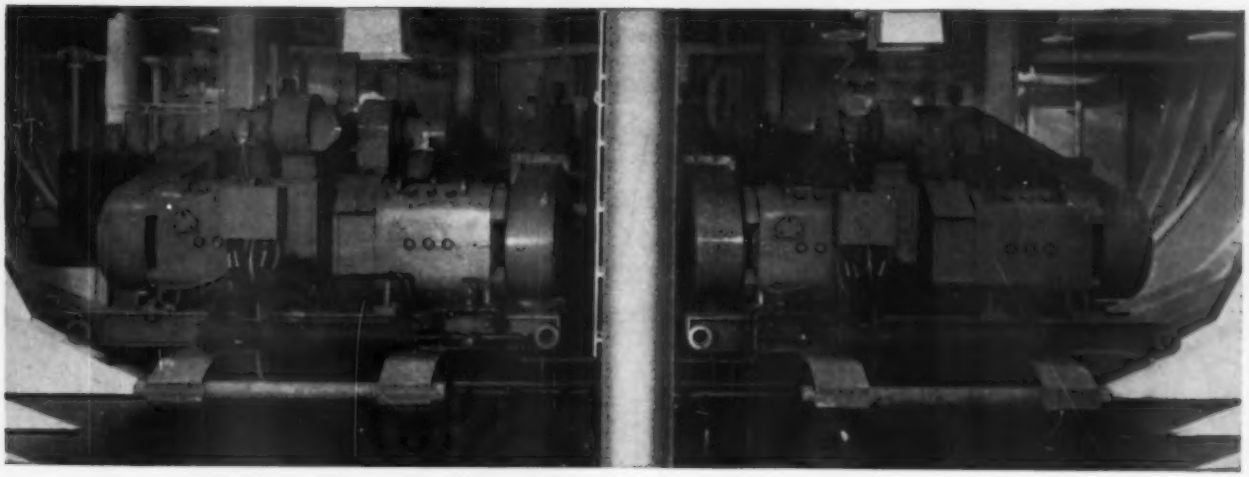


Compact GXR pump installation aboard the *M/V Howard S. Cole, Jr.* Each pump has a capacity of 880 gpm at 65 spm when equipped with maximum-sized liners . . . a maximum operating pressure of 4300 psi when equipped with minimum-sized liners.

New giant drilling tender



Close-up of divided fluid cylinder end of one of the 1000 hp Gardner-Denver GXR's.



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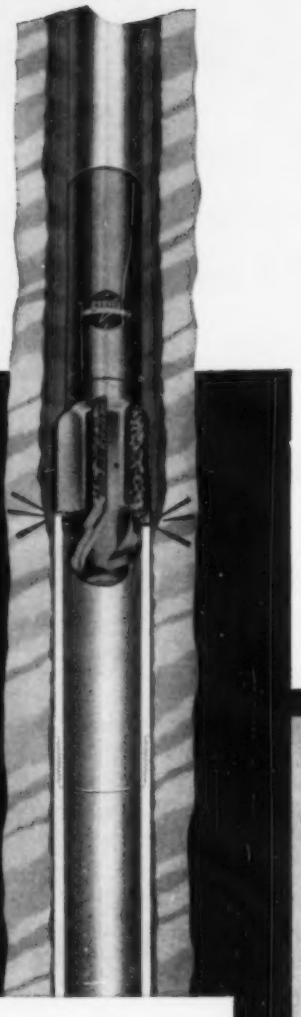

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Csg. Wt. & Grade	Total Footage Milled	Milling Time Hrs.	Milling Time Min.	Avg. Footage Milled per Hr.	No. Mills Reqd.	Depths
7⅝" 33.70# N-80	110.5*	53	05	2.1	4	Below 12,500'
7⅝" 29.70# N-80	103**	28	07	3.6	2	Below 13,000'
7" 26# N-80	82	14	40	5.8	2	Below 10,000'
7" 26# N-80	202***	18	48	10.6	2	Below 14,000'

*Includes milling bottom half of safety joint and cross over bushing.
**22° angle directional hole.
***Includes milling rotary shoe.

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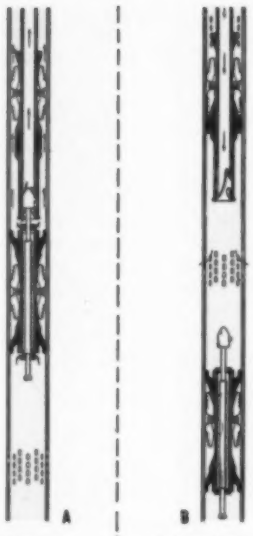
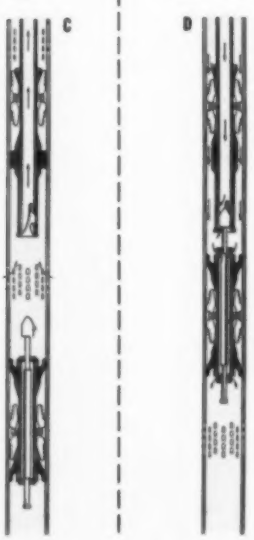


A — Run tools in together

B — Release Plug, straddle interval, fracture or acidize



Swab and Test — C

D — Pick up plug, move to next interval

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Equipment and service trends in drilling and producing

The Challenge in Oil Field

T. A. Huber,
Assistant Chief Petroleum Engineer, Humble Oil & Refining Company, Houston, Texas

THE UPWARD TREND in oil producing cost per barrel is a real challenge to the future of the oil industry when it is considered that there are strong limitations to the price that any producer may receive for his oil. Outstanding technological developments have been of great benefit in slowing down the rate of cost increase but have not been sufficient to fully offset such adverse factors as increasing well depth, lower rate of production per well in prorated states, and less total production per well. Looking forward to the future, probably the most satisfactory means of stemming this trend is to adopt such plans of operation as will lead to wider well spacing. Despite excellent past developments in petroleum production technology, it is believed that the industry has talent capable of bringing about additional and revolutionary developments to provide a measure of relief from the industry's decreasing rate of return which has existed during a period of general prosperity.

In keeping with regulated allowable production, realistic sizing of all oil field equipment should permit substantial reductions in producing costs.

Radical reductions in drilling rig size are needed to take advantage of the proved ability to produce wells through small-diameter pipe.

Greater drilling rig portability is needed for more economically drilling widely scattered well locations.

New completion techniques, workovers, and multiple completions now play prominent roles in the intense effort to maintain current income but much additional improvement is needed.

Although the permanent well completion technique proved that wells can be serviced through small pipe used either as casing or multiple-zone producing strings, substantial improvement is still needed.

Particularly desirable is the continued development of through-the-tubing completion and well diagnosis equipment.

In lease operations, much additional work is required to permit complete automation, including well testing, flow control, and custody transfer.

Many recent developments in technology have come about through the desire to achieve high early economic returns or to hold producing position.

The resulting accelerated oil reserve depletion rate would call for accelerated exploration and drilling if the Industry were called on for a sharp increase in production over a period of years.

Concerted effort on the part of all groups associated with the petroleum industry is required if the industry is to fulfill its role in the economy and defense of the United States.

Presented at the Eleventh Oil Recovery Conference, Austin, Texas, May 8-9, 1958, sponsored by the Texas Petroleum Research Committee.

Some Economic Considerations

The upward trend in finding, developing, and producing costs poses serious problems to the future of the domestic petroleum industry when it is considered that there are important factors limiting the prices that the producer may receive for his oil and gas. Present difficulties of the domestic oil industry do not stem merely from a temporary period of inventory adjustment but are the result of long-term trends that require the serious consideration of both management and technical staffs. The downward trend in rate of return on shareholders' investments for a group of important domestic porducing companies,[1] representing slightly over 20 percent of the U.S.'s yearly production, is shown in Fig. 1. Such downward trend in profits leads to the question: "Why should oil producers' profits consistently decline during a period of general prosperity?" Much of the answer lies in the inability to control costs sufficiently to maintain a satisfactory margin between cost and price received.[2,3] To the indicated finding and developing costs shown in Fig. 1 must be added operational expenditures. It seems unlikely that so continuous and marked an increase in costs could be attributed in any large measure to inept management of the 33 major oil companies whose experience served as a basis for this cost curve. It would seem then that the inability to control costs adequately must lie in physical, political, or economic factors which influence the industry in general.

Cost of finding oil. Among the explanations are the greater difficulty in finding oil, as measured by the higher dry hole frequency, and the necessity for drilling more wildcat wells.[4] During the last 10 years, wildcat wells have increased from 16 percent to 22 percent while dry holes have increased from 32 percent to 38 percent of the total wells drilled each year

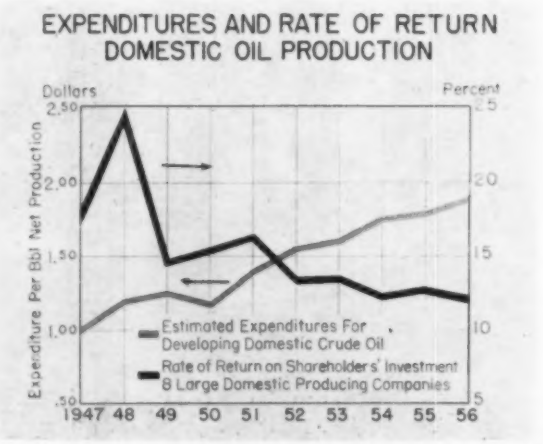


FIG. 1. **Downward trend** in rate of return on shareholders' investments for a group of important domestic producing companies representing over 20 percent of U. S. annual production.

Mechanical Development

New and revolutionary developments are needed in equipment and techniques to halt and turn the tide of ever increasing drilling and production costs

within the U.S. Gross additions to reserves per well drilled have declined substantially so that the per-well costs are spread over fewer bbl of oil[4,5] (Fig. 2). Concurrently, the costs to be absorbed have been increased by greater depths of drilling, and therefore the additions to crude oil reserves per foot drilled as well as per dollar expanded are also declining rapidly.

Rise in operating costs. It is well recognized that operating costs are more closely related to the number of wells produced than to their rate of production. While there has been little or no change in production per well for the U.S., the average oil well in Texas has declined in production from about 22 bbl per day in 1948 to 17 bbl per day in 1957.[4,5] Wells which are capable of full allowable production have, of course, suffered much more severely, currently being permitted to produce on only an 8-day basis. Consequently, major producing areas subject to market-demand proration, such as Texas, have had to contend with the rising per-bbl costs brought about by an increasing number of wells operated with reduced rates of production.

Inflation and imports. These problems have been further aggravated by an inflationary situation (Fig. 3) in which the cost of labor, equipment, and materials purchased by the oil industry has advanced more rapidly than the price of crude oil and petroleum products from which revenue is largely derived. It must be recognized that the price of the oil industry product cannot be increased indefinitely to compensate for the increased cost of doing business. There are fairly definite limitations on domestic crude oil prices imposed by the cost of energy derived from competitive fuels. In terms of dollars of constant value, the effective price ceiling is probably declining by virtue of technological development in the areas of competitive fuels. In the long run, energy from nuclear fuels must be considered as a potential competitor, particularly for large fixed installations.

In the near term, imported oil from Canada and the prolific producing areas of South America and the Middle East is a most potent competitor within the limits permitted under the voluntary import control plan. Should there be any lessening of controls over the importation of foreign oil, competition will become increasingly severe. With respect to the Middle East oils, for example, there will be only the existing import tax of $0.105 pr bbl (crudes of 25 deg API and higher) and a transportation disadvantage to the East Coast of about $0.50 per bbl as compared with pipeline and tanker rates from Gulf Coast fields to compensate for the difference between domestic and foreign costs of production.

Some South American crudes have little or no transportation differential compared with domestic crude delivered to the East Coast; however, in some cases, domestic crudes can support a moderate price differential based on more favorable refinery yields of higher value products. There is, also, a greater utilization and revenue from gas in domestic operations although there is a probability that tanker shipments of liquefied natural gas from foreign concessions may be undertaken within the next few years with some resultant increase in revenue from gas in foreign operations.

Restrictions on gas sale price. It must be recognized that the petroleum industry is a joint product industry and that the costs incurred for the joint product must be derived from

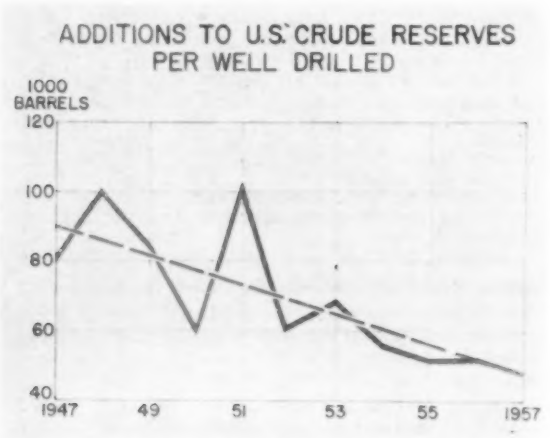


FIG. 2. **Gross additions to reserves per well drilled** have declined substantially so that the per-well costs are spread over fewer barrels of oil.

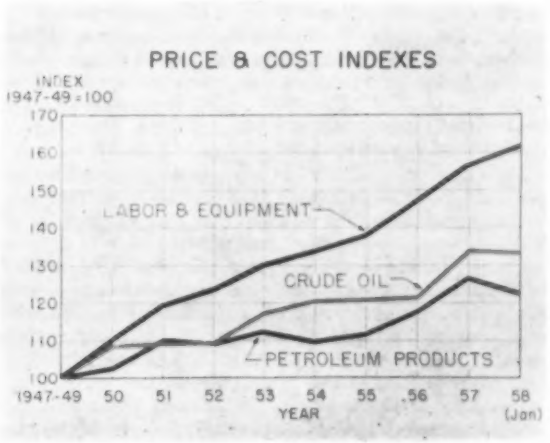


FIG. 3. **Inflation in the cost of labor, equipment, and materials** has advanced more rapidly than the price of crude and products.

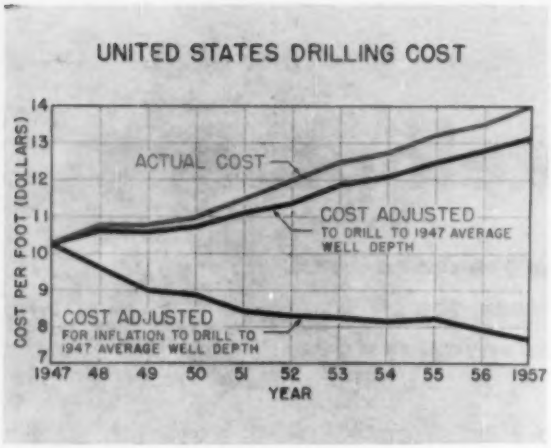


FIG. 4. **Technological developments** have had a marked effect on drilling costs as indicated by these adjusted curves.

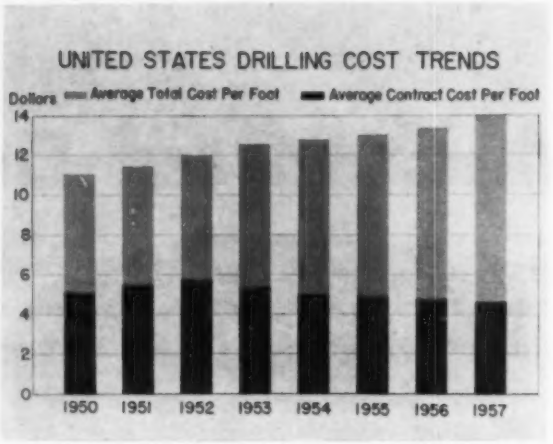


FIG. 5. **Rotary rig performance** has continually improved as shown by a steady decrease in average contract drilling cost per foot from $5.85 in 1952 to $4.60 in 1957, while average total well cost per foot increased from $12 to $14.

the sale of the joint product. Thus, the restrictions on gas sale prices imposed by Federal Power Commission regulation can adversely and substantially affect total revenue of the domestic petroleum industry. Control of field gas prices is becoming increasingly serious because of the greatly expanded marketing of natural gas. Natural gas, which supplied 13 percent of the U.S. energy requirement in 1946, supplied 24 percent of the total in 1956.[6] It is evident that the present weakness of the oil market is attributable in part to the oil industry's own activity in furnishing a substitute fuel at a lesser cost to the consumer.

Coal still in picture. Although coal has been a depressed industry for a number of years, it still must be reckoned with since it provides a more economical source of energy than either natural gas or petroleum fuels in those areas favorably located with respect to sources of supply. The recent installation of the world's largest turbine generator uses coal as fuel. This 275,000-kw unit burns 3000 tons of coal per day, the equivalent of 13,000 bbl of oil.

Shale oil. Commercial development of shale oil may be possible in the near future. Recent information on this subject[7] indicates that crude shale oil can be delivered to California refineries at a cost within 10 percent of the market price of California crude or West Texas crude delivered to the same area. It further suggests that on a replacement-cost basis shale oil should already be considered competitive. The cost for extraction of crude shale oil has not yet been verified by large-scale operations, but several oil companies have acquired large shale oil holdings that may be utilized when commercial shale oil becomes attractive.

Past and Future Progress of Mechanical Development

There is a continuing effort to cope with oil production cost problems through technological improvement. The good results of this effort are well illustrated by an analysis of drilling costs in Fig. 4. The actual per-foot cost[4] of drilling has been adjusted to the estimated cost level which would have occurred if there had been no change in average drilling depth. A further adjustment[8] was made to reflect the cost trend which would have been experienced at constant well depth and in the absence of inflation, indicating that the 1957 cost was about 75 percent of the 1947 cost.

This very favorable decline in adjusted costs observed during the period 1947-57 is primarily attributable to the adoption of improved drilling practices and the development of improved drilling equipment.

Although substantial progress in minimizing drilling and development costs has been brought about through technological developments, continued effort with conventional drilling methods eventually reaches a point of diminishing returns. Substantial future progress must be predicated on basic changes in operating procedures and revolutionary mechanical developments.

Industry has the talent to make such developments. However, it must be realized that present practices are the result of many decades of improvement and refinement and that there is a great deal of natural resistance to overcome not only in a given practice or technique but in the tremendous host of supporting services and materials that presently are and in the future will be essential. Only a very inordinate amount of effort and determination can overcome this resistance, but fortunately for those who have the courage to "plow ahead," it appears that declining profits should bring them allies with less expenditure of effort. **The time is right for radical changes in the mechanical aspects of finding and producing oil.**

WELL INVESTMENT

Drilling represents the principal annual expenditure of the domestic oil industry and is the major investment cost for new wells. The 1957 well investment cost of $3.1 billion was about one-half of the capital expenditure of the U.S. oil industry and represents approximately one-third of the cash value of crude oil, gas, and liquid products produced during that year.[4,9,10] One large operator in the Gulf Coastal area reported the following make-up of costs for 867 wells drilled in 1957 to an average depth of 7293 ft:

	Days	Percent
Move & repair	3.5	7.5
Drill	22.8	49.0
Complete	6.3	13.6
Formation evaluation	4.3	9.2
Fishing & sidetracking	1.9	4.1
Casing cementing, and waiting-on-cement	3.3	7.1
Conditioning mud, directional control, plugging, & others	4.4	9.5
Total	46.5	100.0

Rotary Rig Performance Reduces Costs

Rotary rig performance has continually improved (Fig. 5), as shown by steady decrease in average contract drilling cost per foot from $5.85 in 1952 to $4.60 in 1957, while the average total well cost per foot increased from $12 to $14. The increase in well cost per foot is due primarily to an increase in the depth of wells, an increase in cost of materials, greater accent on marine locations, and an increase in the quantity of wildcat wells now being drilled.

A measure of the effect of improved drilling techniques

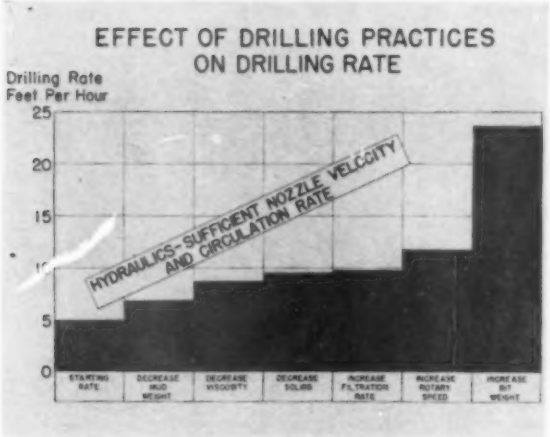


FIG. 6. **Carefully controlled factors** in rotary drilling a normal pressure well will provide an increase in drilling rate from 5 ft per hr to 23.6 ft per hr.

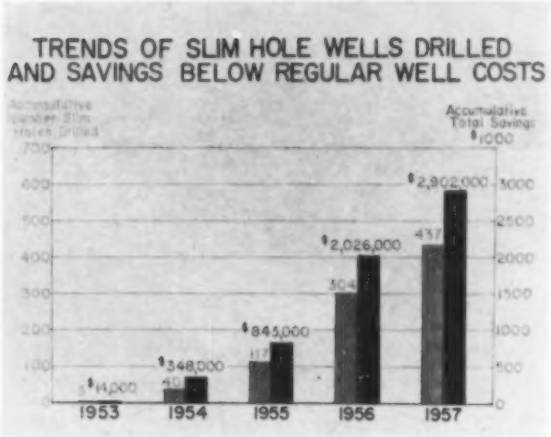


FIG. 7. **One operator's slim hole experience** through 1957 totaling 437 wells at an estimated cost reduction of 15 percent or a saving of $2.9 million.

on the stabilization of drilling costs for any particular depth during the past seven years is a comparison of drilling cost per foot experienced by a major oil company from 1950 to 1957. These drilling costs conform with industry experience[11] during the period considered; however, only onshore wells are compared. If the 1957 costs are adjusted to 1950 dollars, using a drilling cost index for this company to correct for inflation, a well drilled to 12,000 ft in 1957 would have cost about $15 per ft compared to the actual cost of $22 per ft, while the same well drilled to 12,000 ft in 1950 would have cost $21 per ft.

Factors Affecting Drilling Rate of Rotary Tools

Better drilling tools and equipment are available to drill the deep wells today. The most outstanding progress toward reduction of drilling costs has probably been a better understanding of physical factors affecting the rate of drilling with rotary tools. Laboratory and field observation has indicated that drilling rate is principally controlled by (1) bit selection, (2) bit weight, (3) rotary speed, (4) hydraulics of the circulating system, and (5) properties of the drilling fluid. To demonstrate the need for carefully controlling these factors (Fig. 6), a typical set of conditions that might exist while drilling in a normal-pressure area has been changed as follows: Mud weight from 10.2 to 9.5 lb per gal, viscosity from 30 to 15 centipoises, and solids content from 22 to 14 percent. Increased were: Filtration rate from 8 cc to 25 cc, rotary speed from 90 to 120 rpm, and bit weight from 15,000 to 30,000 lb. Based on conservative calculations and the assumption that sufficient hydraulic horsepower was available to provide for complete hole cleaning below the bit, it was estimated that these changes will provide an increase in drilling rate from 5 ft per hr to 23.6 ft per hr. When optimum conditions have been determined for a given well, the same conditions may be utilized in other wells in the general area.

Other Possibilities of Drilling Cost Reduction

General drilling techniques which have permitted cost reductions include the use of air or gas as a circulating medium. When applicable, it has resulted in greatly accelerated drilling rates and increased bit life as compared to the use of drilling mud. The effect on total drilling cost is great, and cost reductions of $125,000 per well have been realized by one company in drilling wells in one area to 11,000 ft. However, the successful use of air or gas drilling thus far has been limited to areas where formation water-flows are not encountered.

Several companies are experimenting with potential drilling techniques such as down-the-hole drilling mechanisms, and outstanding results have been claimed in some instances. Attention has been focused recently on use of a mud-driven turbine[12,13,14] located at the bottom of the drill pipe, while another device being developed is the sonic drill.[15] Several vibratory drills being tested include the percussion drill[16,17] which derives energy from the circulating drilling fluid and the electric vibratory drill.[18,19] Others of interest among possible drilling techniques are the jet or flame-piercing method [15] used to drill shallow blast holes, the shaped charge,[20] electric arc drill,[21] and the electro-drill[22] which have been used for special coring work.

The Movement to Slim Holes

The application of engineering knowledge to the drilling of slim holes has also reduced well costs and enables the use of lighter and more economical drilling equipment. There are substantial savings in casing tonnage through the use of smaller diameter pipe, amounting to 31 percent in a typical 10,000-ft well One operator has been increasing the slim-hole program and through 1957 had drilled 437 slim holes (Fig. 7) at an estimated cost reduction of 15 percent or a saving of $2.9 million. Hole sizes have ranged from 4¾ to 6¼ in.; however, the most popular size has been the 6⅛-in. hole in which 4½-in. oil string has been set.

There has been some reluctance in accepting the slim hole in areas where previous hole trouble has been experienced; however, potential savings in rig and casing costs are very attractive. Recently, a 6¾-in. hole was drilled to a total depth of 9750 ft in an area where 8⅝-in. or larger holes were thought to be necessary. The well was completed with 4-in. casing and 2-in. regular tubing and required only 85 tons of tubing and casing as compared to 130 tons for a conventional well in this area. The drilling time was reduced 5 days, and the total well cost was reduced 32 percent.

Future of Small Bore Holes

In view of savings to be gained through a slim-hole program, it is expected that this practice will be expanded to include hole sizes as small as 4¾ in. with 2 or 2½-in. tubing set as oil strings for tubingless completions (Fig. 8) to effect further economies. Compared to conventional wells having 5½-in. casing with 2-in. tubing strings, a 7500-ft tubingless completion utilizing 2½-in. casing offers a potential saving of 43 percent in tubular goods alone. Additional savings may be derived from the use of less expensive rigs and well equipment.

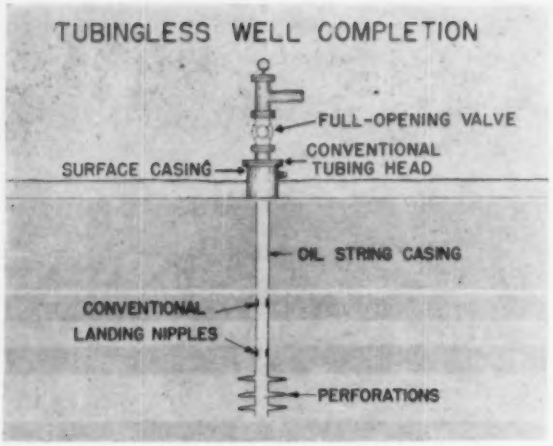


FIG. 8. **Tubingless completions** with 2 or 2½-in. tubing as an oil string in 4¾-in. hole will effect further economies.

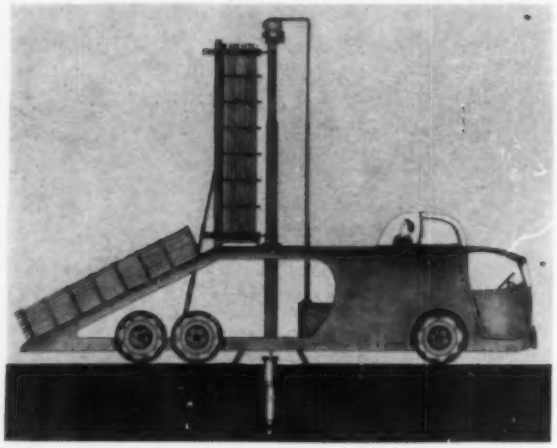


FIG. 9. **Rig of the future** may utilize a bit capable of drilling an entire well. The drill string would serve as the casing, and only a small but powerful rig would be required. It will be highly portable and fully automatic.

The Tubingless Completion

During the past several years the use of the permanent well completion technique has proved the adequacy of a permanently placed small conductor for servicing and producing wells under present producing conditions. Tubingless completions with small casing (2⅞ in.) now appear to be adequate for a significant percentage of wells.[22] Changes in drilling and completing techniques are absolutely essential to take advantage investmentwise of the fact that tubingless small-casing wells are satisfactory for an important part of the total well completions. In addition to these cost savings for current small-hole programs, the trend to smaller bore holes and small-diameter casing should permit revolutionary changes in drilling technique. Drilling small holes has been demonstrated as being both a practical and economical method of reducing well cost and lends support to the conclusion that the law of diminishing returns has virtually caught up with the economics of using larger and more powerful drilling equipment.

Rig of the Future

A more efficient bit or cutting mechanism is needed that will drill smaller holes at a faster rate and have a longer useful life than tools now available. This new bit must be developed to complement other developments that have been made in the rotary system and completion techniques. **A down-the-hole drive mechanism or a wall-gripping substitute for drill collars may be necessary to speed the bit on its way.** Although such developments may seem to be more idealistic than real at this time, there is no reason to believe that equipment to satisfy these requirements cannot be developed.

The rig of the future may utilize a bit capable of drilling an entire well coupled to the drill string which will serve as the well casing, and only a small but powerful rig would be required to lower the drill string into the hole as drilling progresses. A rig of this type (Fig. 9) will not be complete without being fully automatic and would have even greater portability than the mobile rigs now used. This is necessary as well locations for any given operator become more dispersed. Development of better drilling tools for use with the rig of the future is a continuing challenge to manufacturers and to industry, for drilling technology must continually be improved to maintain costs at economic levels which will justify exploitation and development of future oil reserves.

Dual Completions in Small Holes

The experience with smaller completion equipment requiring closer tolerances between well equipment and tools has fostered the use of smaller casing and tubing. Although not completely slim hole in size, dual completions in 5½-in. casing with two parallel strings of 1½-in. tubing are now common[24] (Fig. 10).

When flow through casing is permissible, 2-in. tubing and 4-in. casing or 1½-in. tubing and 3½-in. casing may be utilized for dual completions as all necessary well equipment has already been developed. The logical move to tubingless completions may well bring into being the use of a bundle of parallel tubing cemented in the drilled hole,[23] eliminating the use of a casing string for multiple completions (Fig. 11). Each tube may be utilized as a conduit for well fluid from separate reservoirs.

Formation Evaluation with Slim-Hole Drilling

Virtually all necessary logging and coring devices can be utilized in slim holes as small as 4¾ in. A new drillstem test device that has been successfully utilized and is at present under continued development incorporates a packer within the drill collar string and permits testing of any formation after penetration of the bit without removing drill pipe (Fig. 12). Formation testing at will without pipe removal may eventually permit a drastic reduction in coring operations

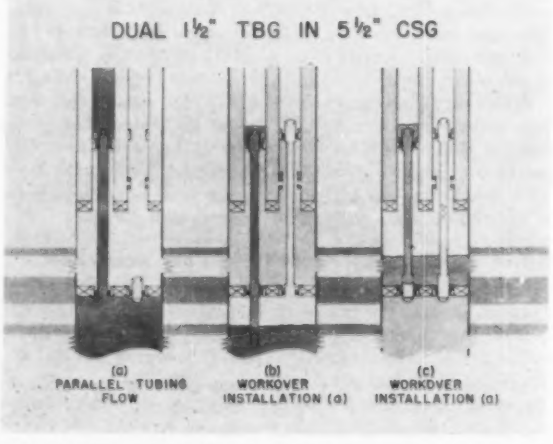


FIG. 10. **Dual completions in small bore holes** requires closer tolerances between well equipment and tools. Dual completions in 5½-in. casing with two parallel 1½-in. tubes are now fairly common.

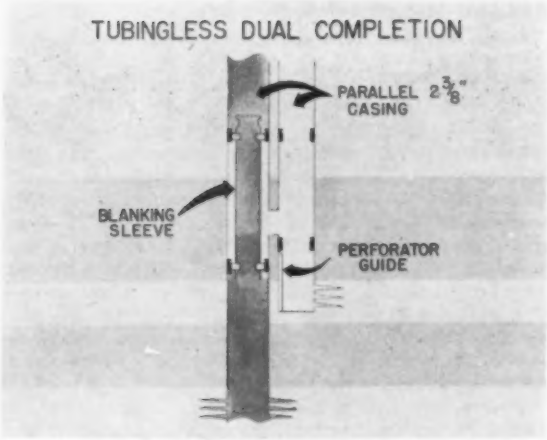


FIG. 11. **Tubingless dual completions** may involve the use of a bundle of parallel tubing cemented in the drilled hole to eliminate the use of a casing string.

which consume more rig time per foot than drilling operations.

The proposed future technique of continuous drilling to total depth and the cementing of the drill pipe as casing indicates the need for a logging tool that will obtain all necessary formation information through pipe after the drill pipe has been utilized as casing and the rig has been removed. Instantaneous drillstem testing as previously described, minimized logging with the universal log tool, and the elimination of unnecessary coring will greatly reduce total well costs. A large amount of rig time and cost is incurred while the rig stands idle during formation evaluation operations. **It is quite possible that there may be a trend toward production testing of these small wells with no attendant rig, and this production testing may well be more economical than drillstem testing or coring during drilling operations.**

WELL OPERATIONS

Trend to Through-Tubing Work

The through-tubing completion and recompletion technique[25,26] has permitted a drastic reduction in well completion cost as well as later well servicing costs. The cement plug may be pumped into place with water when cementing the casing, and the large rig may be removed as soon as the well is equipped with tubing and wellhead equipment. Subsequent perforating[27,28] and testing in the absence of a rig eliminates rig costs and utilizes small truck-mounted surface equipment.

The economic advantages of through-tubing recompletions are illustrated by the fact that in excess of 1500 workover jobs have been performed using wireline techniques alone, with a cost reduction of approximately 30 percent on land and in excess of 85 percent on water locations. Through-tubing tools and methods available today are those for (a) low-pressure squeeze-cementing or plugbacks for ratio control,[29] (b) perforating, (c) radioactive logging, (d) pressure and temperature logging, (e) flowmeters, (f) sand removal, and (g) sand control.[30] Also, the elimination of mud plugging during through-tubing completions and subsequent operations has resulted in a high degree of success in squeeze-cementing, greater well productivity, and more successful sand control operations.

The through-tubing workover technique has made possible the successful use of consolidating plastic for sand exclusion[33] (Fig. 13). This plastic provides an artificial bonding agent between sand grains and eliminates the need for a screen of bridging material inside the casing and is the same plastic which was tried without acceptable success approximately 10 years ago.[34,35] The success ratio in the 1940s was less than 40 percent, but during the past year, 25 jobs have been performed by the wireline technique with success in achieving sand-free production on almost 90 percent of the jobs. Success of this recent sand control endeavor has proved that the use of mud prior to consolidation greatly lessens the chance of a successful sand consolidation.

Slim Holes and Tubingless Completions

The sand consolidation procedure developed for through-tubing operations is especially attractive when it is unnecessary to use small pipe as an inner screen. In small-casing tubingless completions it will probably be practical to place consolidating material as perforating fluid to permit the injection of this material into the formation sand immeditely upon perforating if a pressure differential is maintained into the formation (Fig. 14). It is conceivable that the consolidating material could be used to displace the cement plug, permitting immediate injection following well perforation.

Slim hole workovers: Workovers of slim holes containing 1½-in. tubing may be performed with miniature through-tubing tools, while remedial operations in tubingless completions may be performed utilizing bailers or blanking plugs. (Fig. 15). A well may be plugged back to an upper in-

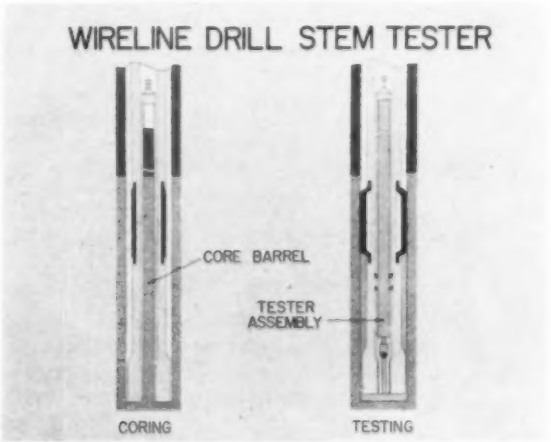


FIG. 12. **A new drillstem testing device** for slim holes is under continued development. It incorporates a packer within the drill collar string and permits testing a formation after penetration without removing the drill string.

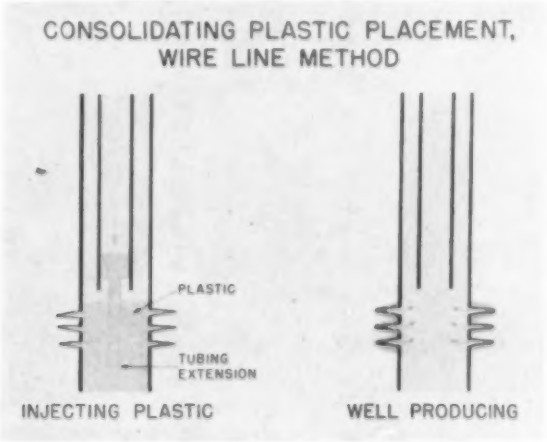


FIG. 13. **Through-tubing workover technique** has made possible the successful use of consolidating plastics for sand exclusion.

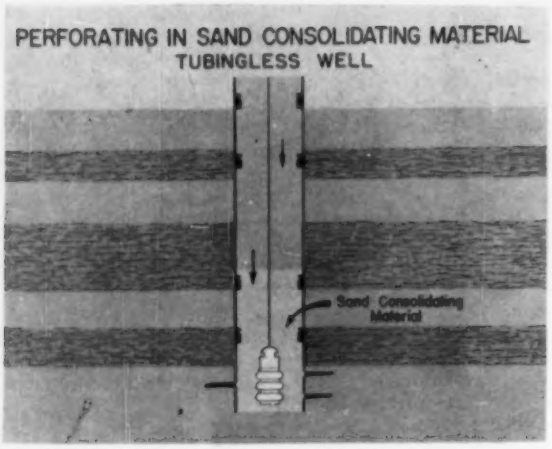


FIG. 14. **Small-casing tubingless completions** will make it practical to place consolidating materials as a perforating fluid. This permits injection of the material into the formation sand immediately upon perforating if a pressure differential is maintained into the formation.

terval by installing blanking plugs in pre-positioned landing nipples or by placing a cement plug with a small dump bailer. The familiar retrievable packoff anchor used to seal tubing perforations or the retrievable production tube[26] used to seal casing perforations between packers may be utilized between these landing nipples to exclude a zone when recompleting in a lower interval (Fig. 16). Although small pipe-hoisting equipment was necessary, all cementing, sand consolidation, and other techniques developed for the permanent completion technique have been performed through ¾-in. tubing inside small casing.[36] Modern tubing operations such as the thread dope squeeze may well be utilized with plastics or other materials to seal casing leaks in tubingless completions.[37]

All the above-mentioned methods of recompletion are fully adaptable to dual completions, and techniques have been developed for working over both upper and lower zones in dual completions having two parallel strings of 1½-in. tubing inside 5½-in. casing.[24] A multiple completion consisting of a bundle of tubing strings sealed in a small bore hole may be recompleted by any of the methods utilized with tubingless completions, or the permanent completion technique may be used by opening communication ports between tubing strings to permit fluid circulation.

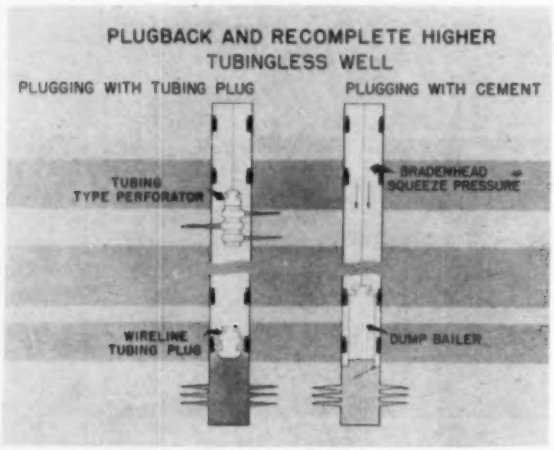


FIG. 15. **Remedial operations** in tubingless completions may be performed by utilizing bailers or blanking plugs.

Artificial Lift of Small-Pipe Wells

Lower investment, operating, and maintenance costs have been obtained during the past 10 to 15 years through the proper sizing of pumping units to known well requirements, by the precise design of valve settings and optimum spacing for gas-lift valves, and by the use of retrievable gas-lift valves and free-type subsurface hydraulic pumps. **The trend to "retrievability" is now being supplemented by a trend to "miniaturization." Equipment and techniques developed for conventional 2 and 2½-in. tubing wells have generally proved adaptable to the smaller tubing of slim-hole or dual wells.** A 2⅞-in. well can be rod-pumped without tubing; and, if necessary, gas can be vented through hollow sucker rods or 1-in. tubing can be used for sucker rods providing flow paths for both fluid and vented gas. An insert-type pump can be accommodated to either 1¼-in. or 1½-in. nominal size tubing with ½-in. sucker rods.

Two or more strings of small tubing can be cemented in a small drilled hole to permit utilization of one string as a source of gas-lift gas when using valves[38] or as a source of power oil when using a free-type subsurface hydraulic pump. The third small tubing string may be used for venting gas when necessary. Gas-lift installations of this type have been made on a number of occasions. It is conceivable that here again the bundle of small tubing cemented in the bore hole will permit a common gas-lift supply or power oil string for lifting two separate zones.

Higher productivities, through the use of proper completion fluids, and sand control in slim holes or tubingless completions could well extend the life of flowing wells and alleviate the premature failure of artificial-lift equipment from erosion. Artificial lift of slim holes offers great possibilities for mechanical development as it is entirely possible that the artificial-lift system of the future could be (1) energy transmitted to a subsurface pump through a standing wave made to vibrate through a string of rods, tubing, or stiff wire, (2) a plunger lift powered by rocket fuel which would be automatically recharged in a lubricator at the surface, or (3) a high-temperature heat source placed at the bottom of the well to vaporize all fluid entering the well bore.

Aim of the Through-Tubing Method

Objectives of the permanent completion process have not changed and are: (1) Establishment of a complete through-tubing subsurface information service for providing diagnosis of well conditions — possibly as a unified operation; and (2) a rapid successful recompletion technique that prevents formation damage and is performed with a minimum

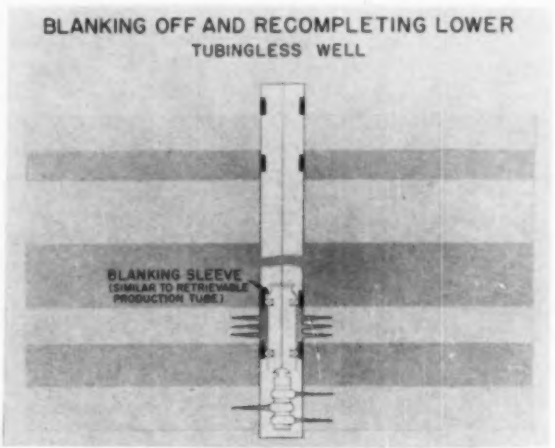


FIG. 16. **To recomplete in a lower interval** of a tubingless well, the familiar retrievable packoff anchor used to seal tubing perforations or the retrievable production tube used to seal casing perforations between packers may be utilized between landing nipples.

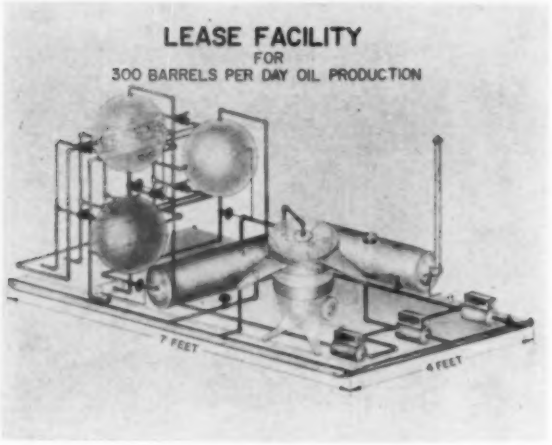


FIG. 17. **Automatic lease facility** above measures 4 by 7 by 4½ ft and contains 1-in. manifolding, a 16-in. spherical oil and gas separator, a 12-in. by 36-in. 50,000 Btu per hr heater, a free water knockout if necessary and a power-driven centrifuge.

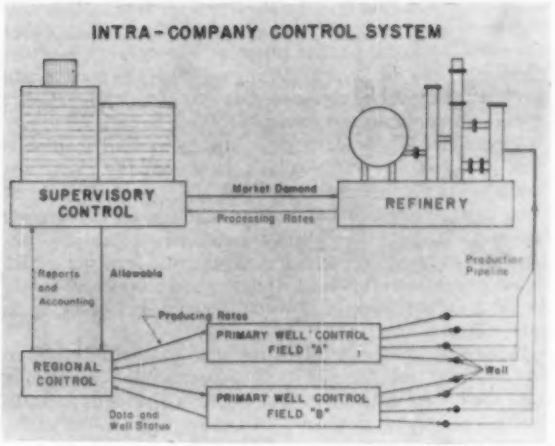


FIG. 18. **Complete automation** from well to refinery is possible by an intracompany system to perform various manipulations required with a minimum amount of labor. It consists of three basic control loops, each controlling the next lower system.

of manpower and equipment — again, a one-stop, one-service operation.

It is encouraging that these objectives are now in sight. Many fine tools have been developed, and the trend to miniaturization will soon bring into being all other essenital through-tubing-information instruments. Sand control, cementing, perforating, and other remedial operations are now developed, and the complete through-tubing techniques are being improved and reduced in time. Rapid advances in drilling technology to match completion technology should make possible more economical wells and permit these wells to be maintained at optimum capacity in the most economical fashion.

FIELD OPERATIONS

Producing facilities at the lease or field level remain stationary and continually perform the same duty although the throughput may vary from time to time. This, then, is the field of endeavor in which automation or economics developed by the equipment manufacturing industries may be applied to the oil industry.

Any serious discussion of automation of producing facilities would be incomplete without an examination of present oil and gas-handling facilities in consideration of automation's ultimate objective. One of the industry's oldest operations is usually performed as follows: Oil is flowed or pumped from the well through *a manual* flow control, *manually* directed to a lease tank, *manually* gaged, *manually* started into pipelines, *manually* directed to a tank in a storage terminal, and finally, *manually* introduced into a more or less automatic refinery process stream. Obviously, quite a large amount of high-cost labor is involved in the usual handling of oil from the oil reservoir to the ultimate consumer. In addition, certain clerical functions are necessary such as preparation of royalty owners' and operators' pay checks, processing and retention of business information, preparation of regulatory body and business reports, and others. It appears reasonably favorable on the basis of present technology to mechanize virtually all of the above functions.

Semiautomatic lease operations[39] were put into practice in some areas 10 to 15 years ago; however, completely automatic operations[40] were put into experimental use only in the last 2 or 3 years. These involve the automatic custody transfer of crude oil from producer to pipeline. Such units, although experimental, have already assured operating and accuracy success where comparatively large volumes of production are handled. It is necessary to justify such systems economically for small rates of production as it is no longer possible to enjoy the luxury of overdesigning. Equipment must be production-line fabricated so that lease facilities become unitized shelf items and custom plumbing is eliminated. The present batch-handling of crude oil production must be converted to continuous measurement to reduce costs and to obtain a record of production and sale of oil that requires a minimum of correction, checking, and accounting for the complete maintenance of records.

The positive displacement meter of the rotary type and positive volume measuring tanks lend themselves to incorporation in unitized lease production facilities, and both systems have consistently demonstrated accuracy greater than conventional hand gaging. The positive displacement rotary meter is particularly valuable in high-paraffin-content fields while the positive volume measuring tank is essentially free of the need for repetitious calibration. A production rate of 100 bbl per day is only 3 gal per min, and a unit sized for 300 bbl per day or 9 gal per min should handle heading and possible water production. A unit of this size (Fig. 17) measures 4 ft by 7 ft by 4½ ft and contains 1-in. well manifolding, a 16-in. spherical oil and gas separator, a 12-in. by 36-in. 50,000 Btu-per-hour heater, a free water knockout if necessary, and a power-driven centrifuge which divides the flow stream into water and clean oil. Because BS&W content cannot be satisfactorily measured, the centrifuge fluid separator is used to eliminate BS&W. The centrifuge in this small unit is only 2 hp in size.

Test and production gas meters are mass flowmeters[41] which measure gas throughput as mass, eliminating the necessity for temperature or pressure corrections.

This measurement may be converted to volume; however, weight measurement is more representative of actual gas value. This unitized production facility can be installed for approximately 50 percent of the old style tank battery. Not only are reductions in investment and operating expense possible but the following advantages are apparent: (1) Possible handling of oil from wellhead to refinery at elevated pressure to eliminate all weathering losses, (2) continuous use of full pipeline facilities enabling transportation systems to be smaller, and (3) simplification and reduction of present-day production accounting.

Extension of the Automation Principle

One of the essential distinctions between the concept of complete automation of a production facility and mechani-

zation efforts to date is that delivery of oil from a lease has been considered to be the logical end of the mechanization sequence. To make further progress, this concept must be broadened, and all steps in getting oil from the reservoir to the consumer must be considered as part of an automatically controlled, continuous-flow-type process.

A possible system for performing the various manipulations required for an automatic intracompany producing system with a minimum amount of labor would consist of three basic control loops, each controlling the next lower system (Fig. 18). The basic component would be a primary well control loop containing automatic feedback which would adjust flow, follow its programmed production schedule, and execute special instructions upon detection of an unusual condition.

Individual wells would be controlled locally by information obtained from the well itself or by information obtained from the higher echelon control loops. A district or regional controller would accept well status and demand information, determine the flow rate for each well, and transmit this and special instructions to the well control system. In this fashion such items as basic allowable changes, pipeline demand factors, intermittent production of wells, scheduled shutdowns for well servicing, and transmission of basic data are properly treated.

The **intracompany coordinating loop provides that information which production needs to coordinate its activities with other company functions. It is technically possible at the present time to assemble such a system and make it function.** Each automation loop may be installed as economic incentive dictates, without causing obsolescence of the preceding loop, and permitting reduced labor costs and increased efficiency of operation. It is considered reasonable in the light of present technology to expect that such an operation will be practical within the foreseeable future.

ADAPTABILITY TO MARINE OPERATIONS

The trend to miniaturization and automation may well have great potential economy in marine operations where investment and operating costs are now extremely high. One step in drilling technology has already been accomplished; a small mobile platform equipped with a typical inland jackknife workover rig has been used to drill wells to depths exceeding 9200 ft. Were the bore hole size reduced still further and slim-hole techniques utilized, this small equipment could be used to drill producing wells to depths of 12,000 ft in locations where water depth is from 40 to 50 ft.

The daily operating cost of this small mobile platform and workover rig is 50 percent of the large mobile offshore rigs utilized in this depth and deeper waters. The miniature producing facilities make possible the use of one small template or caisson around the producing well, thus eliminating the large production platform. Elimination of the large platform precludes the need for deviated holes with their attendant higher cost. Remedial operations of an offshore well, using a small wireline reel on the platform and all cementing, pumping, and power equipment located on a nearby floating barge, have already been accomplished and can be readily adapted to the single-well, small-size structure. The final step may well be complete automatic well control from shore-based locations whereby flow rates are controlled, wells are shut in, and data are recorded without the necessity of a trip to the well location.

ECONOMIC AND OTHER FACTORS

Over the years the petroleum producing industry has vigorously expanded, and this expansion has proceeded and developed mainly along early-conceived ideas on methods of drilling and producing. During this growth, many supporting services and facilities have keyed their developments to fit in with the earlier basic conceptions so that an enormous

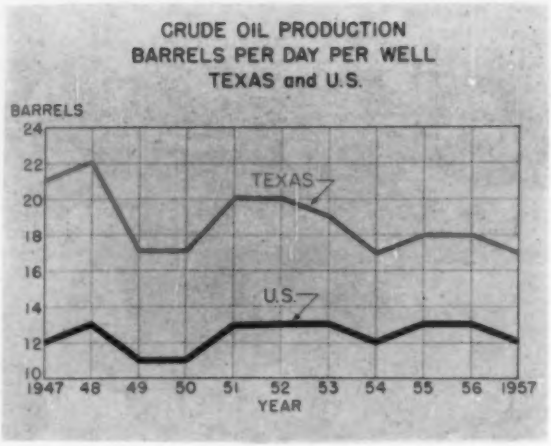


FIG. 19. **Curtailed and declining rate of production of wells** in Texas cannot be cured solely by mechanical operating improvements.

interdependent system has grown up. Important changes in any facet of this operation can set off requirements for extensive changes in many large supporting arms or services of the industry. This fact is probably much more important in petroleum production than in any other large industry. Coupling this with the tendencies that in good times there is no great economic incentive for change and that in times of economic recession developments are impeded by budget reductions and by "wait-and-see" attitude, it can be realized that the industry has a doubly difficult situation in bringing about or adjusting to great changes in technology.

Basic business improvements needed. Although engineering and scientific effort can materially assist in maintaining a necessary differential between income and costs, it cannot indefinitely sustain a profitable situation unless more basic improvements are made in the industry's manner of conducting business and the atmosphere in which it is conducted. Technical development alone cannot resolve the problems of the domestic oil industry. The rapid decline in additions to proved oil reserves per well (Fig. 2), the low rate of production per well in the U.S. (12 bbl per day), and the somewhat higher but curtailed and declining rate of production of wells in Texas (17 bbl per day) (Fig. 19) cannot be cured solely by mechanical operating improvements.

Crude oil reserves per producing well in the U.S. are slightly over 50,000 bbl per well, while the reserves in Texas are somewhat higher (84,000 bbl per well) but declining rapidly (Fig. 20). We have also learned how to produce reserves at a faster rate by means of various improvements. As a result, even with production at less than maximum efficient rates, the output of crude oil in 1957 bore about the same relation to estimated reserves as in 1948 for both Texas and the U.S. In other words, active drilling in the past decade has not served to improve the ratio of known reserves to production.

Exploratory and development drilling. It is recognized that until unexpectedly dramatic new and greatly improved oil-finding methods may be discovered, the domestic industry must continue to expand its *exploratory* drilling. This is imperative in order to find the larger annual discoveries of new crude reserves that will be needed to provide the sustained ability to produce at the higher rates necessary to meet the expected growing domestic demands for oil and gas and to keep the U.S. largely self-sufficient in these fuels for national security reasons.

In sharp contrast with the need for expanded *exploratory* drilling, the decline in crude oil reserves developed per well is believed to demonstrate clearly that far too great a portion

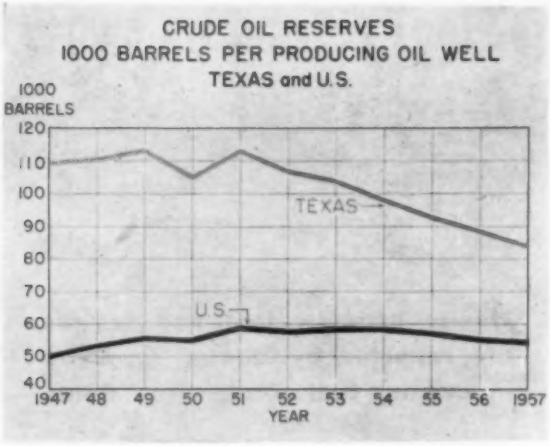


FIG. 20. **Crude oil reserves per producing well in the U.S. for 1957 were 50,000 bbl. In Texas, this figure was somewhat higher at 84,000 bbl, but rapidly declining.**

of the drilling effort has been expended in excessive and much too closely spaced *development* drilling. While such intensive and excessive *development* drilling has provided a high level of current crude oil productive capacity or availability, this has been obtained at high capital investment costs which have also contributed to growing high unit operating costs for the domestic industry as a whole, especially so under the sharply curtailed oil production rates currently effective in Texas and other producing states in the Southwest. This has placed the domestic industry at a significant disadvantage in competing with high-capacity foreign oil wells and fields where the reserves developed per well are many-fold greater than in Texas or the U.S.

Well spacing, proration and unitization. The only way in which the domestic petroleum industry can hope to achieve or maintain a satisfactory competitive position with foreign oil and other energy sources is to create an economic and political climate which will enable it to realize the same operating economies as are obtained through the practice of wide well spacing as is now employed in developing large foreign oil fields. This could be attained if operators and regulatory bodies would take these important steps: (a) Accept and practice assiduously the widest possible well spacing physically *needed* to drain and produce efficiently (within the limits of the MER of the field or individual wells) the oil and gas from the underground reservoirs; (b) adopt allocation formulae or rules that avoid encouraging unnecessary development drilling by placing the emphasis on reserves or productive acreage developed by the drilling of wells, rather than mainly upon the well itself with little or no regard for the size of the productive area attributed to it or the reserves that it actually develops, and (c) encourage the more widespread practice of unitization or other similar type joint operation which usually enables greater oil recovery, more efficient operation, and much lower investment and operating costs.

For a healthy domestic oil industry. Practice of the aforestated principles or practices for efficient development drilling and operation of oil and gas fields will avoid physical waste and accomplish a maximum conservation effort. It will preserve and protect equities among operators and land owners. Finally, coupled with expected continued technological improvements in exploration, drilling, and producing operations, it will go far in fostering and maintaining a healthy domestic oil industry with the essential economics, vitality, and reserves necessary to meet emergencies and the competition of foreign oil and to supply petroleum products to the public at the lowest possible prices over the long term.

References

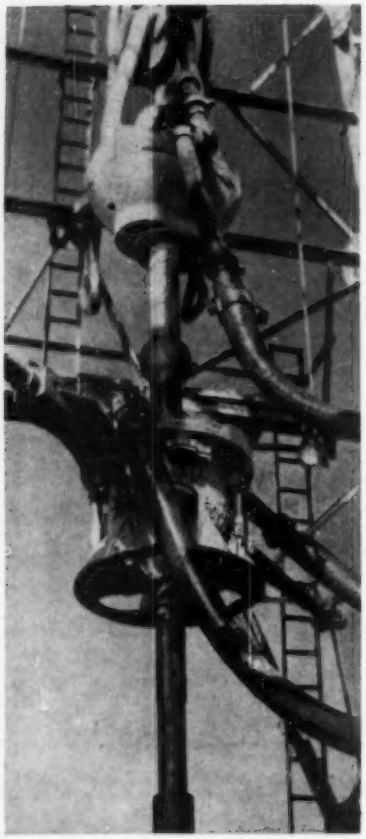
1. Baker, Hines H.: *Statement on Petroleum Prices*, Humble Oil & Refining Company, Houston, Texas.
2. Pogue, J. E., and Hill, K. E.: *Future Growth and Financial Requirements of World Petroleum Industry*, Chase Manhattan Bank, New York City.
3. Coqueron, F. G., Anderson, N. J., and Haskell, D. P.: *Petroleum Industry 1956*, Chase Manhattan Bank, New York City.
4. "Salient Oil and Gas Statistics of U. S.", *World Oil* (February 15, 1958) 146, No. 3, p. 90.
5. "Crude Reserves Fall Below '57 Figures," *Oil & Gas Jour.* (Mar. 17, 1958) 56, No. 11, p. 80.
6. *Monthly Petroleum Report Supplement*, Bureau of Mines, Jan. 1957.
7. Miller, E. P., and Cameron, R. J.: "*Oil Shale Economics*," Rocky Mountain Section AIME, Denver, Colorado, March 3-4, 1958.
8. *Expenditures for Drilling and Equipping Wells — 1953*, Survey by IPAA, API, and Mid-Continent Oil and Gas Association.
9. "Deeper Drilling Trend Seen in AAODC '57 Statistics," *The Petroleum Engineer* (March 1958) 30, No. 3, p. B-125.
10. "Industry Optimism Seen in 1958 Budgets — Here's Comparison with 1957," *Oil & Gas Jour.* (January 27, 1958) 56, No. 4, p. 190.
11. "U. S. Drilling Costs," *World Oil* (Feb. 15, 1956) 142, No. 3, p. 138.
12. Parsons, C.: "Drilling by the Turbine Method," *World Oil* (July 1, 1949) 129, No. 3, p. 87.
13. Postelwait, W. R.: "Is the U. S. Lagging Behind Russia in Turbodrill Development?", *Oil & Gas Jour.* (Nov. 7, 1955) 54, No. 27, p. 93.
14. Trebin, F. A.: "Turbine Drilling in the U.S.S.R.," *Proceedings of the Fourth World Petroleum Congress*, Rome, Italy, June 6-15, 1955.
15. "Sonic Drill Versatile," *Oil & Gas Jour.* (June 27, 1955) 54, No. 8, p. 74.
16. Brown, R.: "The Bassinger Rotary Percussion Drill," *The Petroleum Engineer* (Dec. 1950) 22, No. 13, p. B-42.
17. Harpst, W. E., and Davis, E. E.: "Experiments in Rotary Percussion Drilling," *Oil & Gas Jour.* (March 17, 1949) 47, No. 46, p. 182.
18. Brooks, W. B., Randerson, L. W., and Schall, F. W.: "New Drilling Developments," *Proceedings of the Fourth World Petroleum Congress*, Rome, Italy, June 6-15, 1955.
19. "Summary Report of a Study of Rock Properties Affecting Vibratory Drilling of Oil Wells and of Electro-Mechanical Transducers for Drilling Oil Wells," Battelle Memorial Institute, Columbus, Ohio, August 31, 1950.
20. French Patent No. 1,026,538, del. February 4, 1953, filed October 26, 1950, P. J. L. A. Trouilloud.
21. Steiger, A. J.: "Russian Electric Arc Drill Nears Oil Field Test Stage," *Drilling* (March 1958) 19, No. 5, p. 106.
22. Arutunoff, A.: "Electrodrill Recovers Representative Cores for Secondary-Recovery Projects," *Oil & Gas Jour.* (May 26, 1949) 48, No. 3, p. 106.
23. Huber, T. A.: "Development of Services and Equipment for Small Holes," *Jour. of Petr. Tech.* (April 1956) VIII, No. 4, p. 13.
24. Tausch, G. H., and Kenneday, J. W.: "Permanent-Type Dual Completions," API Southern District Spring Meeting, San Antonio, Texas, March 7-9, 1956.
25. Huber, T. A., Allen, T. O., and Abendroth, G. F.: "Well Completion Practices," *API Proc.*, Prod. Bul. No. 236 (November 1950) pp. 24-36.
26. Tausch, G. H., and McDonald, Price: "Permanent Type Completions and Wireline Workovers," *The Petroleum Engineer* (September 1956) 28, No. 10, p. B-39.
27. Lebourg, M. P., and Hodgson, G. R.: "A Method of Perforating Casing Below Tubing," *Trans.* AIME (1952) 195, p. 303.
28. Caldwell, Blake M., and Owen, Harrold D.: "A New Tool for Perforating Casing Below Tubing," *Trans. AIME* (1954) 201, p. 302.
29. Huber, T. A., Tausch, G. H., and Dublin, J. R., III: "A Simplified Cementing Technique for Recompletion Operations," *Trans.* AIME (1954) 201, p. 1.
30. Huber, T. A., and Tausch, G. H.: "Permanent-Type Well-Completion Developments," API *Drilling & Production Practice* (1955), p. 103.
31. Slusser, M. L., Glenn, E. E., and Huitt, J. L.: "Factors Affecting Well Productivity: I. Drilling Fluid Filtration," 31st Annual Fall Meeting, AIME, Petroleum Branch, Los Angeles, California, October 14-17, 1956.
32. Glenn, E. E., and Slusser, M. L.: "Factors Affecting Well Productivity: II. Drilling Fluid Particle Invasion into Porous Media," 31st Annual Fall Meeting, AIME, Petroleum Branch, Los Angeles, California, October 14-17, 1956.
33. Tausch, G. H., and Corley, C. B., Jr.: "Sand Exclusion in Oil and Gas Wells," API Southern District Spring Meeting, Houston, Texas, February 26-28, 1958.
34. Smith, R. H., and Polk, A. C., Jr.: "Use of Plastics in Consolidating Loose Sands in Wells," AIME Tech. Pub. 2147, *Petroleum Technology*, March 1947.
35. Wrightsman, G. G., and Spain, H. H.: "Consolidation of Sands in Oil and Gas Wells," *Oil & Gas Jour.* (July 19, 1957) 46, No. 11, p. 73.
36. Goeken, R. J.: "Report on the Methods and Results of Concentric-Tubing Workovers," API Southern District Spring Meeting, Houston, Texas, February 26-28, 1958.
37. True, M. E., and O'Reilly, W. M.: "Subsurface Sealing of Tubing Thread Leaks," *Jour. of Petr. Tech.* (March 1957) IX, No. 3, p. 67.
38. Garrett, H. U., and Taylor, Donald M.: "Parallel Macaroni String Cuts Well Costs," *The Petroleum Engineer* (January 1957) 29, No. 1, p. B-38.
39. Weber, George: "Automatic Lease Operation," *Oil & Gas Jour.* (August 5, 1948) 47, No. 14, p. 74.
40. Geer, R. L., and Meyers, D. C.: "Automatic Lease Production System," *The Petroleum Engineer* (May 1956) 28, No. 5, p. B-49.
41. Macintyre, J. R., and Ballard, R. G.: "Mass Flowmeter for Gases," *Oil & Gas Jour.* (November 12, 1956) 54, No. 80, p. 159.

The Latest . . .

Drilling Equipment

Newest products, tools and services are reported by leading suppliers in drilling and exploration fields

Drilling Rigs and Equipment



Rotary Power Swivel Developed

250 A new device to speed drilling has been developed by Baash-Ross. The device, a rotary power swivel, eliminates the conventional drilling swivel, the kelly drive bushing, the rotary table as a rotary device, and the compound chain drive used to rotate the rotary table.

The swivel is a rotating power transmission device which can be attached to the upper end of drilling pipe and can be driven hydraulically, electrically, or by air. It permits the use of multi-joint stands of drill pipe to reduce the number of connections that must be made on the rig floor. Stand length is limited only by the height of the derrick. In addition, it permits the cutting of longer cores as it is not necessary to pick-up from the bore face every 30 ft to make a new connection as with conventional equipment.

Baash-Ross has produced units up to 160 hp. Larger swivels are still in the development stage and units as large as 600 hp are being considered. Applications of the unit in addition to drilling include internal cutting of casing or drill pipe, drilling out sand bridges, drilling out cement plugs, drilling out obstructions in casing, deepening of existing wells and various fishing and down-hole cutting operations. *Baash-Ross Division, Joy Manufacturing Company.*

Separator Salvages Drilling Mud Solids

251 Refection of 60 to 90 percent of drilled clay solids in drilling mud with recovery of 80 to 90 percent of barite are values of the new Clayjector, a cyclone-type separator. The unit is a joint development of Dorr-Oliver, Inc. and Salt Water Control, Inc. Heavy muds may be maintained without excessively watering back or diluting and subsequently adding large quantities of barite. Weight material may be reclaimed from discarded or reserve mud.

The Clayjector may be run while adding oil to maintain mud weight and prevent adding new barite. After preliminary adjustment, operator can regulate feed weight with one valve. Four DorrClones feed a common, adjustable underflow and a single waster pipe controlled by a valve. The Clayjector will handle 30 bbl per hr of 18 lb per gal mud and 55 bbl per hr of 14 lb per gal mud. *Dorr-Oliver, Inc.; Salt Water Control, Inc.*

High Pressure Rotary Hose

252 The Goodall Rubber Company of Texas has added a new rotary drilling hose to its list which can withstand the highest drilling pressures produced on any rig now in use. In addition to high-pressure tolerance, the hose features a coupling which is built into the hose and is stronger than the hose to which it is attached. A safety clamp increases the safety and strength of the hose, reinforcing the point of maximum stress.

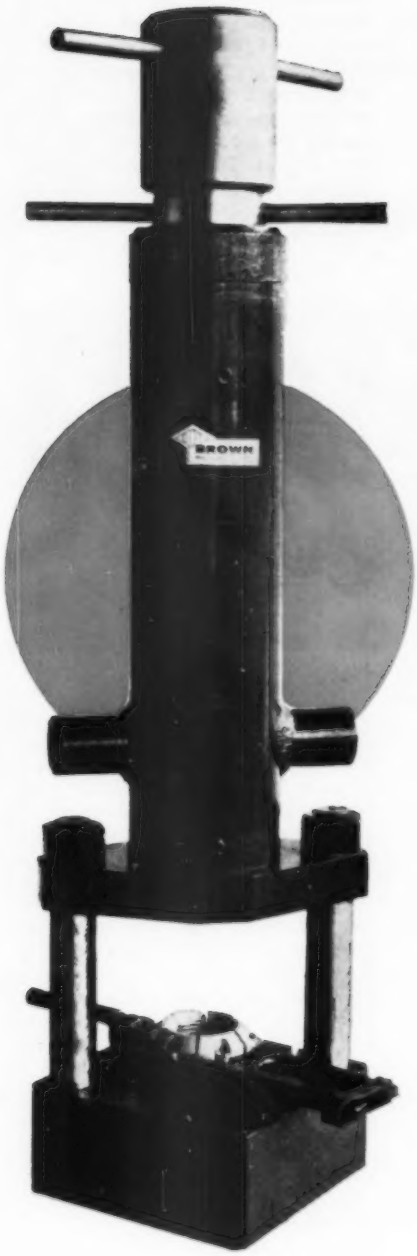
The hose is unconditionally guaranteed against defect in workmanship and/or material for one year. If hose is damaged during normal operations, Goodall will salvage the rotary hose, if possible, or convert the undamaged footage into vibrator hose of any desired length. *Goodall Rubber Company of Texas.*

Drilling Rig Drive Systems

253 New d-c electric drive systems for drilling rigs are available from the Westinghouse Electric Corporation. The d-c motors have intermittent ratings of 1600, 575, and 500 hp, and the generators have input ratings of 790, 590, and 270 hp. Motors and generators are force-ventilated by means of motor-driven blowers. The

Brown Introduces Tool For Well and Personnel Safety...

The TUBING BLEED-OFF ASSEMBLY



The Brown Tubing Bleed-Off Assembly was designed with one purpose in mind . . . to provide SAFE operations while pulling sanded-up or plugged tubing.

When pressure trapped between bridges makes normal tubing pulling operations unsafe, this device may be used to insure control of the well at all times. The Tubing Bleed-Off Assembly eliminates the possibility of damage to the well, rig or workover equipment, and the operating crews.

The advanced and outstanding features of this tool provide:

- Safety to operating personnel since the tubing cannot blow out of the hole
- Control of the well to prevent "blowouts"
- Controlled flow of fluid from the tubing
- Method of keeping rig floor clean when tubing unloads
- Means of directing produced fluid to storage area or facilities
- Rig safety since oil is not allowed to unload from tubing onto the motors
- A means of circulating the well to control it or kill it
- A means of accurately locating bridges by use of a pressure gauge and guesswork is eliminated

The assembly is basically a pressure-tight mud-box with seals which hold in both directions. Outlets are provided between the seals to allow for controlled "bleeding-off" of trapped pressure, and to allow for circulation back into the hole to "kill" the well.

The assembly is constructed with external upper seal and lower seal pack-off around the tubing to control trapped pressures when the tubing joint is broken between bridges. Two side outlets provide a means of connecting a pressure gauge, and, if desired, a flow line, between the seals.

The square bottom plate is designed to fit into the rotary table and is internally machined to accommodate standard tubing slips. A slip segment in the upper portion of the tool holds the tubing once the connection is broken and prevents the tubing from "blowing out of the hole." When the connection is broken, the upper portion of the tool, containing the upper seal, is free to rotate with the tubing. It is designed for either 2" or 2½" nominal tubing.

The Tubing Bleed-Off Assembly is another in the long list of "firsts" by Brown Oil Tools. Each tool manufactured or put in service by Brown is designed for maximum safety of the well, equipment and personnel. Additional information on this new tool can be obtained by contacting the nearest Brown representative. Or write Brown Oil Tools, Inc., P. O. Box 19236, Houston 24, Texas.

BOT
BROWN
OIL TOOLS, INC.

8490 Katy Road, Houston, Texas.

MWL Tool & Supply, Midland, Texas, and Hobbs, N. Mexico; Regan Forge & Engr. Co., San Pedro, Calif.; Consolidated Service Co., Casper, Wyo. Acme Well Supply, New York City; Import Tool Co., Edmonton and Calgary, Alberta, Canada; A-Z Export, S.A., Maracaibo and Puerto LaCruz, Venezuela; Miguel Rocca, Mexico City.

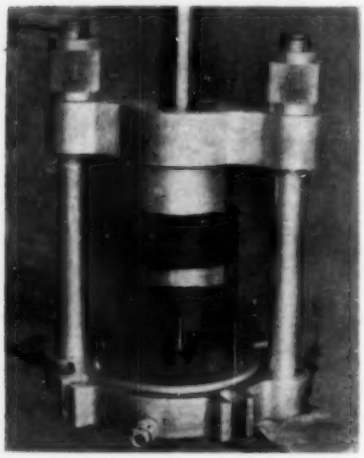
blower is driven by a 220/440-v a-c motor obtaining power from the auxiliary a-c generators. Individual blowers are installed and result in only one main motor being affected in case of air stoppage.

Double shaft extensions are provided in certain sizes permitting the generators to be used singly or in tandem. The tandem arrangement, when used, eliminates the necessity for additional mechanical connections which are required when generators are mounted side by side. *Westinghouse Electric Corporation.*

Pressure-Powered Pulling Tools

254 Grant Oil Tool Company has placed a new line of pressure-powered pulling tools on the market designed to eliminate piston-pulling difficulties and the heating and torch-cutting of valve seats.

The impact valve-seat puller, first of the tools to be developed, is based on a new principle in valve-seat pulling. The



puller is connected to the valve seat in the conventional manner, but utilizes a pair of pressure plates powered by a small, harmless blank cartridge to jar the valve seat out of the pump. The new tool is simple to operate and will not damage the mud pump.

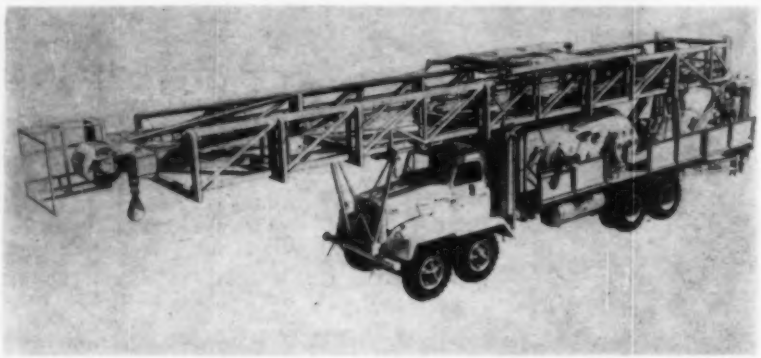
The second tool in the line, the hydraulic piston puller, also uses a pair of pressure plates in place of the old-fashioned wedge. In this tool, however, the pressure is applied by means of a small hand-operated hydraulic pump. The pressure plates form the base of the tool and the piston rod stands vertical in the puller when the tool is in use. Pressure is applied by the hydraulic pump through a screw-type grease fitting at the base of the tool. *Grant Oil Tool Company.*

Double Drum Servicing and Workover Hoist

255 A new double drum hoist unit for 15,000-ft servicing and workover has been introduced by Cardwell Manufacturing Company. Available as a power take-off driven unit (Model K251) or separate engine-powered unit (Model K250), the hoist is adaptable to a wide range of truck or trailer mountings. Nominal input is 250 hp, with both units being capable of utilizing up to 350 engine hp.

Model K251, the power take-off unit, makes available 10 forward and 2 reverse speeds to the main drum through a double-end drum drive, with 2 drum clutches mounted on the shaft ends. Five forward and 1 reverse speeds are available for sand drum operation. Model K250, separate engine powered, is a single engine torque converter drive hoist. Two forward speeds are available to the main drum and one forward speed to the cathead shaft, sand line drum and rotary drum.

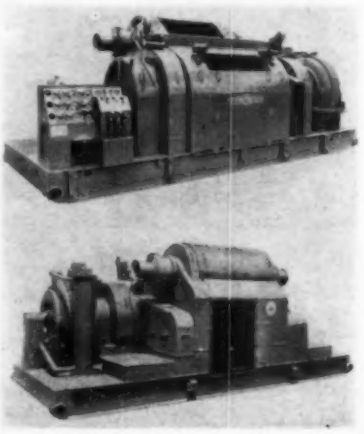
Mast on the K251 is a free-standing, 90-ft mast with 170,000-lb hook load capacity, designed to rack tubing in doubles and to handle rods in triples. It is constructed in 2 telescoping sections, with five 23½-in. OD crown sheaves on roller bearings. Four sheaves are grooved for 1-in. line, and one for ⅝-in. line. Mast erection, telescoping and locking is controlled hydraulically. *Cardwell Manufacturing Company.*



Rigs Added To Diesel-Electric Line

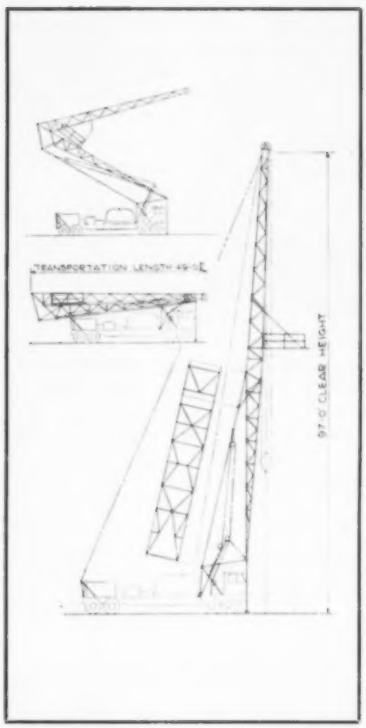
256 Two new rigs intended primarily for diesel-electric operation have been added to The National Supply Company's rig family. The Type 1625-DE rig will normally be considered for drilling in the 16,000 to 25,000-ft depth range, using 1⅜-in. or 1½-in. wire line. Power for the drawworks is provided by two or three 625 to 650-hp motors, or two 1000-hp motors. The Type 1320-DE rig is intended for the 13,000 to 20,000-ft depth range, with power furnished to the drawworks by one 1250 hp or two 625/650 hp electric motors.

Each drawworks is basically of 1-piece design, on a heavy 18-in. beam base, and embodies provision for a sand reel. A rear section that accommodates the electric motors and the motor drive portion of the drawworks transmission may be detached for transportation purposes. The rotary may be driven by a countershaft, accommodated on a small, detachable front section of the drawworks base, or by an independent electric motor. The transmission shaft carries 2 drives to the drum and there is a choice between additional drives on the primary shaft of the motor drive, thus affording a choice between 4 hoisting speeds. The Type 1625-DE drawworks has a drum 36 in. in diameter and 61¼ in. long, which permits hoisting 135-ft stands of drill pipe with 8 lines without spooling more than 3 full layers of line on the drum. The drum of the Type 1320-DE drawworks is 30 in. in diameter and 56¼ in. long. Both drums are integrally grooved. *The National Supply Company.*



Folding Servicing Mast

257 A new folding type well servicing mast has been developed by Lee C. Moore Corporation. The folding design permits the shortest possible transportation length, reducing overhang to a minimum and making the unit easier to maneuver in tight locations. Since the mast folds rather than telescopes, there is a positive bearing of one leg on top of the other when the mast is erect rather than an overlapping of legs. This eliminates the complex latches that would otherwise be required if the mast telescoped vertically.



The mast is designed in 65 ft, 70 ft, 86 ft, and 97 ft sizes. The 97 ft mast has a static hook load capacity of 180,000 lb with 6 lines strung to the traveling block, and the other 3 masts have a static hook load capacity of 120,000 lb with 6 lines strung to the traveling block.

The mast is mechanically raised in a single stage operation and does not require external guys to develop its rated capacity. The mast can be mounted on a truck, semi-trailer, or self propelled vehicle and will accommodate a selection of drawworks and power combinations. *Lee C. Moore Corporation.*

Blowout Preventer Rated To 10,000 psi

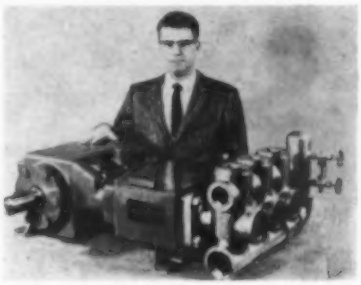
258 A new high-pressure blowout preventer that safely controls well pressures to 10,000 psi has been placed on the market by Hydril. The preventer is similar in design to Hydril's standard preventers. However, all components have been increased in size, weight, and strength to provide a working pressure rating double that of any previous units made by the company. Improvements include a seal ring design to withstand greatly increased working pressures. Ring assembly consists of a resilient double U-seal ring supported between 2 back-up rings. The rings interlock with each other for assembly as a unit in each of the preventer's 2 ring grooves.

The model has a maximum service pressure rating of 10,000 psi. It is regularly furnished with a 10-in., 10,000-psi flanged body and a 10-in., 10,000-psi studded connection on the head. A studded body is available on order. *Hydril Company.*

Corrosion-Resistant Power Pump

260 A new power pump is being manufactured by Worthington Corporation. This model KCA power pump has been developed as a waterflood and salt water disposal pump and is manufactured in corrosion-resistant aluminum bronze.

Features of the pump include interchangeable plungers over wide diameter range (1¼ to 2½ in.; straight-flow design for maximum volumetric efficiency; and large pipe connections, 3 in. suction and 2 in. discharge on either side. *Worthington Corporation.*

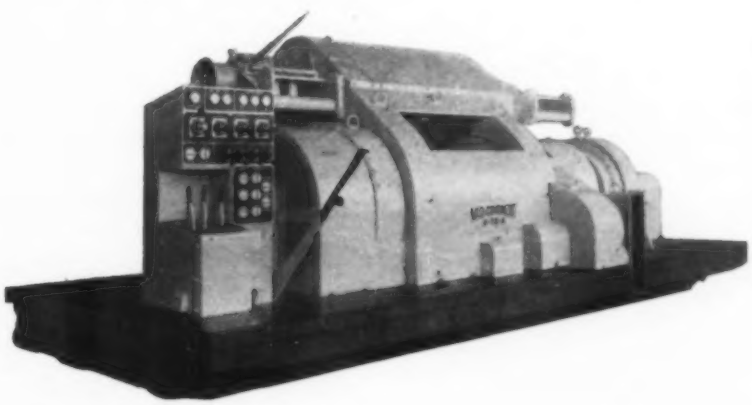


Drawworks Designed for Medium Depth Drilling

259 Faster and more efficient drilling is the feature of an all-new drawworks, the U-712-A, being offered by Mid-Continent Supply Company. Operating controls have been incorporated into a single console. This centrally-located panel equipped with speed selection levers and air-actuated clutch controls provides complete control of the rig by the driller with minimum effort. The unit, manufactured by Unit Rig & Equipment Company, is designed for medium depth drilling in the 8000-10,000 ft range.

Rated at 700 to 1200 net input horsepower, the package unit contains hoisting drum, transmission, rotary drive, and auxiliary brake. Drum shaft assembly features an 8½-in. shaft with balanced drum design for maximum wireline life. The drum, 25 in. in diameter by 51½ in. long, provides less than 3-wrap spooling when hoisting 90-ft stands in an 8-line reaving system and using 1¼-in. wire line.

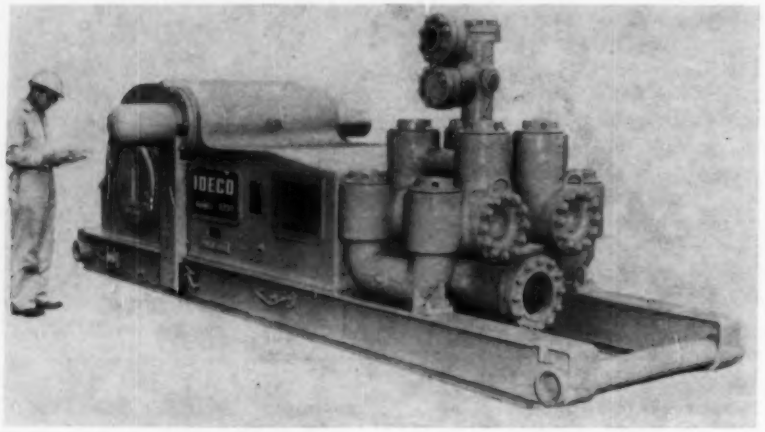
Two-shaft transmission with 3 forward ratios and a gear reverse combine with the hi-drum and lo-drum drives to give 6 forward and 2 reverse speeds at the hoisting drum. Three forward and one reverse speed are available to the rotary countershaft, catshaft, and sandreel. *Mid-Continent Supply Company.*



High-Pressure Slush Pump

261 Designed to meet high-pressure requirements of deep drilling and heavy-duty service, a new 1250 hp Mud-Master duplex slush pump announced by Ideco features double-row bearings and 20-in. herringbone gears. Unusual compactness and low weight per horsepower result from short bearing centers and all-steel fabriform construction. One-piece normalized steel fluid end has extra-thick walls and streamlined passages. Each fluid end is hydrostatically tested to 9000 psi on the discharge side and 4500 psi on the suction side before final assembly. In addition to the standard discharge and suction connections of 4-in. and 10-in. there are optional connections of 5 or 6-in. discharge and 12-in. suction.

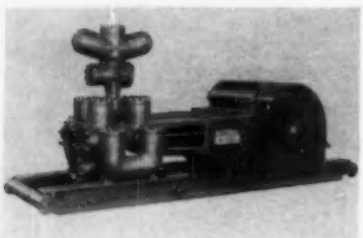
With 8-in. liners and at 65 strokes per min, the pump will deliver 940 gal per min at 1940 psi. With 6-in. liners it will deliver 495 gal per min at 3680 psi. Stroke is 18-in. *Ideco, Inc.*



Slush Pump Features Lightweight, Portability

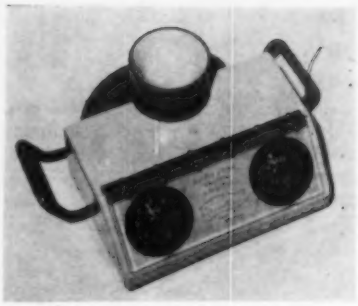
262 The new National H-850 slush pump has a rated input of 850 hp and hydrostatic test pressure of 8000 psi in the fluid cylinder. Bore is 8 in. maximum and stroke 15 in. The main frame is made of steel plates and steel casting which are welded into one unit. Fluid end is a 1-piece, high-strength steel casting with no internal baffles or walls.

Fatigue life is improved by holding and tightening the liner packing independently of the liner so that the packing carries a load only great enough to seal off fluid pressure. Stresses created in the cylinder bore by the pressure of the liner packing are no greater than those created by fluid pressure alone. The cylinder head bore is packed off at a point well in from the face of the cylinder, which cuts nearly in half the length of this bore exposed to fluid pressure. This reduces the stress level in the bore. A dual cage fluid end arrangement permits independent adjustments of liner packing and cylinder head packing, and permits better retention of the liner. This arrangement was introduced to provide for jet drilling where operation at near rated pressure is continuous. *The National Supply Company.*



Derrick Weight Control Indicator

263 A new Safety-Weight control indicator is now offered to indicate (1) guy line loads and changes, (2) pipe mast or portable derrick foundation loads and changes, (3) wind loads on portable derricks, (4) load on rods when pulling stuck pumps, (5) load on swab line, (6) and load on tubing pulls. The indicator sets under the pole or derrick mast adjusting screw and on the mast foundation,



taking the place of the conventional steel base plate. It is made either as a contained unit for observation at well head or with remote indicator for platform operators. It can also be furnished with a timing device to record surge loads on indicator. *Pennant, Inc.*

Mast Offers Time-Saving Features

264 Designed for ease of erection, dismantling and transportation, Oilwell's new Lever-Lift, 136-ft guyless mast utilizes a new lifting principle which speeds the overall operation. Mast is made up of top, center and bottom sections, and has a gross nominal API capacity of 612,800 lb. The rated capacity is 400,000 lb with 8 lines to the block. Fast line and dead line are outside the mast, giving more working room inside. Center and bottom sections consist of 2 pieces each. Thus, the main mast of 5 separate pieces may be loaded on 2 semi-trailers and 1 truck for longer hauls.

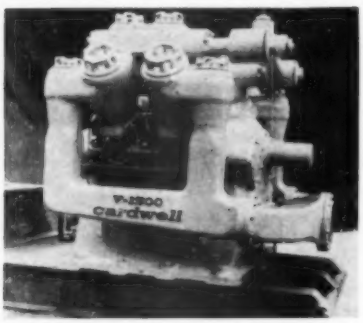
Wide-spread, tapered, trussed rear legs are designed to provide maximum vision, more working room and greater stability. An eccentric leg adjusting mechanism simplifies alignment of the traveling block and hook with the rotary table. With mast in vertical position, leveling and centering is accomplished by turning these eccentric hinge pins to achieve desired results. *Oil Well Supply Division, United States Steel Corporation.*

Heavy-Duty Drilling Mast

265 The latest and largest addition to Continental-Emsco's B-Series masts is the B-142. This mast is an openfaced mast with a 1,053,000-lb nominal gross capacity. It has a clear working height of 142 ft and has a racking capacity of 23,760 ft of 4½-in. OD drill pipe or 19,260 ft of 5-in. OD drill pipe. Rear leg pivot design permits low level assembly while wide standard substructure makes mast extremely stable under all conditions.

No auxiliary equipment is needed to raise the mast since the drawworks

supplies the power. Mast legs pin directly to the substructure at near floor level, allowing visual inspection at any time from substructure floor. The mast can be leveled in a few minutes by removing or adding shims from beneath the rear or drawworks face legs. Masts can withstand 75-mph wind with pipe in the rack or 100-mph wind on the bare mast and every mast carries the API monogram. *Continental-Emsco Company.*



Powerful Pump Weighs 16 Lb per Horsepower

266 A new innovation in mud pump design has been announced by the Cardwell Manufacturing Company. Cardwell's V-1500 mud pump is approximately ⅓ the weight of any mud pump in the large horsepower class and is capable of operating under pressures of 4000 psi and delivering volumes up to 969 gal per min. Among the features of the V-1500 pump are 4-cylinder, V-type construction, high speed operation and 2-piece crankshaft. The pump is of plunger design eliminating the pistons and fluid liners commonly associated with mud pumps.

The pump is capable of utilizing 1500 input hp. It weighs only 16 lb per hp and handles, at rated operating speed, volumes of drilling fluids ranging from 969 gal per min to 545 gal per min with maximum pressures ranging from 4000 to 2250 psi, depending upon plunger size. Cylinder heads and valve covers on the high-pressure fluid end are of threaded design for easy installation and removal. A confined type, high pressure seal is used on the openings. Seals are located below the cover threads and prevent mud from reaching the threaded surfaces of the covers.

The pump has a bore and stroke of of 6 in. by 9 in.; a 4 in. discharge opening with a 5 in. optional, and a 12 in. suction inlet. The pump measures approximately 7 ft long, 7 ft wide, and 7 ft high. It has a unit weight of 24,000 lb. *Cardwell Manufacturing Company.*

Blowout Preventer Accumulator Unit

267 A new 40-gal accumulator unit, the "Wildcat 40," manufactured by the Carthage Tool Company, is equipped with a new high pressure, high volume pump designed for fast accumulator charging and preventer operation in case of accumulator failure. Measuring 10 ft by 5 ft by 3 ft, the complete unit of pumps, accumulators, control equipment, and fluid tanks is skid-mounted for easy handling during transport and at the rig.

The unit is completely automatic and requires only 100 psi air pressure to give fluid pressure needed for preventer operation. Components of the unit include 2 pumps, two 20-gal float type accumulators, fluid control manifold, automatic pressure control switch, and 80-gal fluid tank and 10,000-psi gages. The unit is designed for 80-gal accumulators without changing any of its dimensions. *Carthage Tool Co.*

Rotating Drilling Head

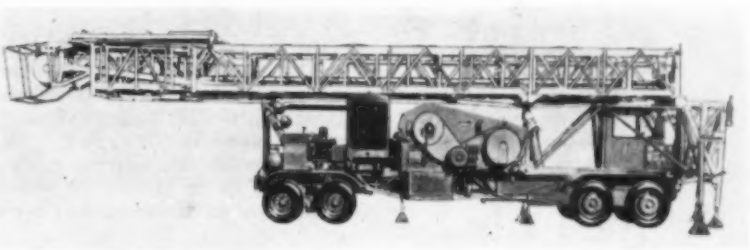
268 The Guiberson Corporation has announced a new rotating drilling head for well servicing and completion work, slim-hole drilling and air or gas drilling.

The head has a built-in rotary table with unitized slips and heat-treated kelly drive bushings. Rubbers are available to pack off the pipe sizes of ¾ in. through 3 in. The head has a 4⅞-in. opening through the head with rubber removed and will accommodate a 3 in. square kelly. *The Guiberson Corporation.*

Carrier-Mounted Pulling Unit

269 Wilson Manufacturing Company has introduced its new 1958 Winchmobile which features cross-mounted engine and torque converter and 2 chain drives from converter to drum. Two masts are available for the unit: 140,000 lb or 180,000 lb capacity. The masts are 90 ft high and 96 ft high, respectively, and are hydraulically raised and telescoped.

Bevel gear, transmission and oil bath vertical drive are built into one unit. Four speed and reverse heavy-duty truck-type transmission drives tandem rear wheels. *Wilson Manufacturing Company, Inc.*



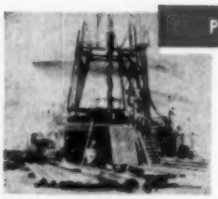
SPECIAL OIL WELL PROBLEMS REQUIRE HALLIBURTON'S SPECIAL CEMENTS AND ADDITIVES

Every oil well drilled has an individuality of its own. Two wells in the same field, drilled to the same depth, may require altogether different cementing techniques. In many cases, special well characteristics require special materials to help assure maximum cementing effectiveness and well protection.

Halliburton, the world's most experienced cementing organization, is *especially* qualified to help solve special oil well problems. Developed by laboratory research and field experience, Halliburton special cements and chemical additives have been proven to be effective wherever needed. Such problems as sulfate and salt water corrosion, high pressure gas and oil zones, elevated temperature of deeper wells ... these and others have been solved or minimized through the application of Halliburton's chemical aids.

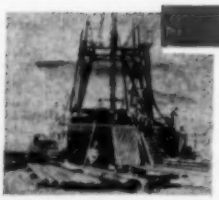
It takes but a moment to call your nearby Halliburton representative. Protect the investment you have in your well with the best cementing available today ... Halliburton, of course!

THESE ... AND OTHER ... HALLIBURTON CEMENTS AND CHEMICALS CAN HELP TO SOLVE THE SPECIAL PROBLEMS OF YOUR OIL WELLS:



POZMIX CEMENT ... THE OUTSTANDING POZZOLANIC COMPOSITION

Pozmix Cement is a blend of pozzolanic materials and portland cement with desirable characteristics that cannot be obtained with neat portland slurries. It is resistant to sulfate and salt water corrosion. Pozmix Cement is also lower in cost, easier to pump, easier to perforate, less permeable and more durable. It has an outstanding record of proven performance in a wide variety of applications.



POZMIX 140 ... FOR HOT, DEEP WELLS

Designed for oil well cementing where formation temperatures range from 140° to 400° or higher, Pozmix 140 is a pozzolanic composition made up of Pozmix "A" or "S", hydrated lime and set control additives to give it early initial strength. It contains no portland type cement. At temperatures above 140°F, Pozmix 140 equals or exceeds strength specifications for oil well cements, yet is designed to provide a maximum pumpability in the deepest of wells. Results with Pozmix 140 have demonstrated its effectiveness in every case.

RADIO-ACTIVE CEMENT... NEWEST SCIENTIFIC AID

RAC-1 and **RAC-2** are useful in locating cement tops, even in multi-stage jobs, locating the treated zone after squeeze cementing, locating split pipe. Half-life of material makes for safe, surer identification of cement, even after considerable delays following original job. No contamination to equipment or production. Also **RAYFRAC** Sand, for use in fracture location and differentiation.

HR-4... RETARDER

A small amount of HR-4 added to the mixing water or the dry cement at Halliburton bulk plants results in a composition with a retarded set, permitting placement at high temperatures. It is used with portland or Pozmix Cement in the deepest of wells.

HR-7... DISPERSANT AND RETARDER

Used mostly in wells of moderate temperature, HR-7 is a chemical dispersant and retarder designed for high gel cement compositions. HR-7 is effective in obtaining smoother and more fluid gel cement slurries.

HA-5... AN EFFECTIVE ACCELERATOR

An improved accelerator for oil well cementing slurries to be used for surface pipe or shallow wells. Higher compressive strengths at early ages are obtained, permitting W. O. C. times as short as four hours on surface pipe at temperatures of approximately 80°F.

MUD-KIL... AN EFFICIENT NEUTRALIZER

A dry, granular material that effectively neutralizes the cement-retarding properties of mud treating chemicals such as quebracho and other tannins, starch, sodium carboxymethyl cellulose and lignite. Pumping time and compressive strengths of cement remain relatively constant.

HI-DENSE... HELPS TO CONTROL HIGH PRESSURE ZONES

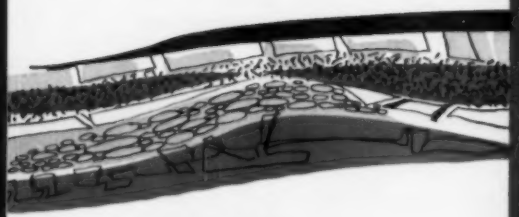
Ground to a fineness that requires a minimum amount of mixing water, Hi-Dense is designed to increase the density of cement slurry and aid in controlling high pressure gas and oil zones. Because of the high specific gravity of Hi-Dense, it is possible to weight cement slurries to 20 lbs./gal., yet still maintain pumpability and strength stability at high temperatures.

HALLIBURTON CEMENTING SERVICES

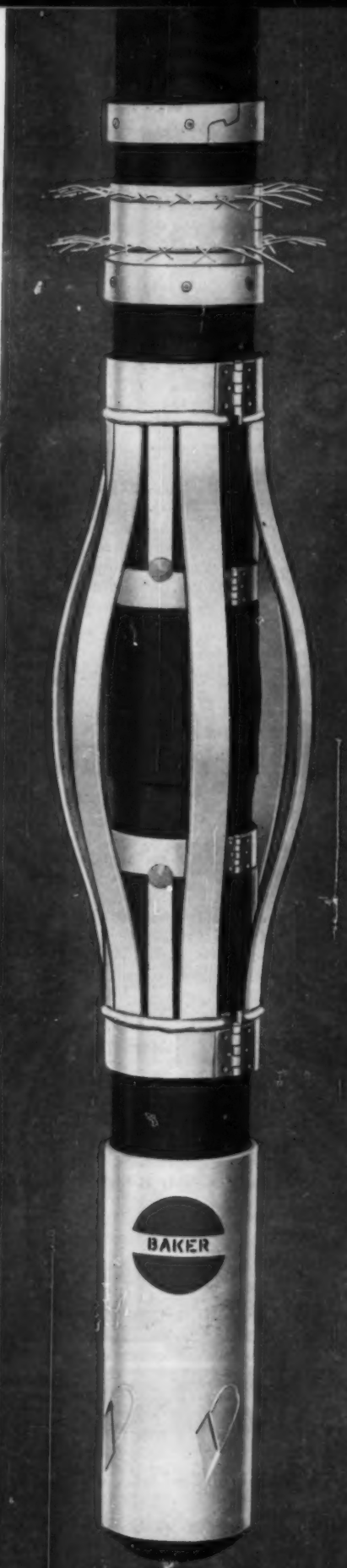
HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

IF YOU WANT MORE* THAN A GOOD CEMENT JOB...

* *Casing on Bottom Safer and Faster*
* *Protection of Productivity*



...Specify *BAKER* PRIMARY CEMENTING EQUIPMENT



Baker Wall Scratchers

HINGE-LOK or SOLID-RING Models for all popular casing sizes.

Baker Casing Centralizers

HINGE-LOK or SOLID-RING Models with Multiple Ranges for all popular casing sizes.

Baker Fill-Up Equipment

DIFFERENTIAL Shoes and Collars for *any* well, and economical FLEXIFLOW Shoes and Collars for wells of *moderate* depth.

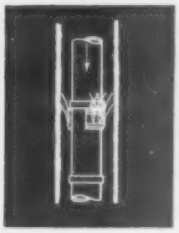


Fig. A

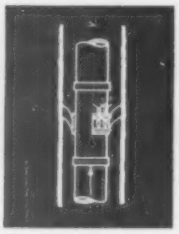


Fig. B

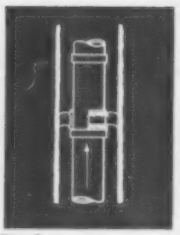


Fig. C

Fig. A Scratcher wires, retained by integral hinged mounting, swing freely upward and do not remove mud cake while running in.

Fig. B Even when casing is lifted out of the slips, the entire Scratcher remains stationary. Only when reciprocated, and

Fig. C ...only at the cementing area does the "scissors" action of the crossed wires remove mud cake.

Baker Scratchers remove mud cake only from the cementing area; this "controlled scratching" protects productivity.

While running in, the scratcher wires automatically swing upward along the casing, where they are safe from damage; permit free, unrestricted lowering of the casing; and do not disturb or remove mud cake. There is no danger of "balled-up" mud collecting on the scratcher wires to plug the annulus and contribute to pressure surges with possible "mudding-off" of the producing zone. Only when the cementing area is reached and the casing is reciprocated do the double rows of strong "crossed" spring wires automatically reach out, dig in, and remove the mud cake with efficient "scissors" action.

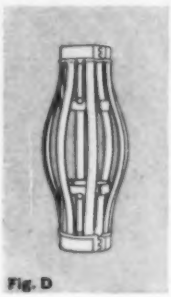


Fig. D

Fig. E

Fig. F

Fig. D "Extended" Range HINGE-LOK Baker H-25 Casing Centralizer. Product No. 9113.

Fig. E "Normal" Range HINGE-LOK Baker H-20 Casing Centralizer, Product No. 9112.

Fig. F "Slim Hole" SOLID-RING Baker G-15 Casing Centralizer, Product No. 910-G.

Baker Centralizers provide the clearance for good cementing, yet do not remove mud cake that can restrict productivity.

The QUALITY of Baker Casing Centralizers starts with "sled-runner" springs made of high quality spring steel – tested and pre-set by flattening in hydraulic presses – then butt-welded to collars to form a unit of great strength. Pre-setting of the springs to the pre-calculated optimum bowed height enables each centralizer to pass tight spots or dog legs without damage to the assembly, and ensures GREATER CENTERING FORCE for maintaining annular clearance for cementing.

Baker Centralizers do not remove mud cake which could plug the annulus, contribute to pressure surges and restrict productivity.

BAKER OIL TOOLS, INC.

Houston • Los Angeles • New York

Fig. G

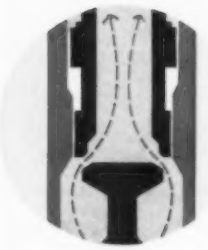


Fig. H

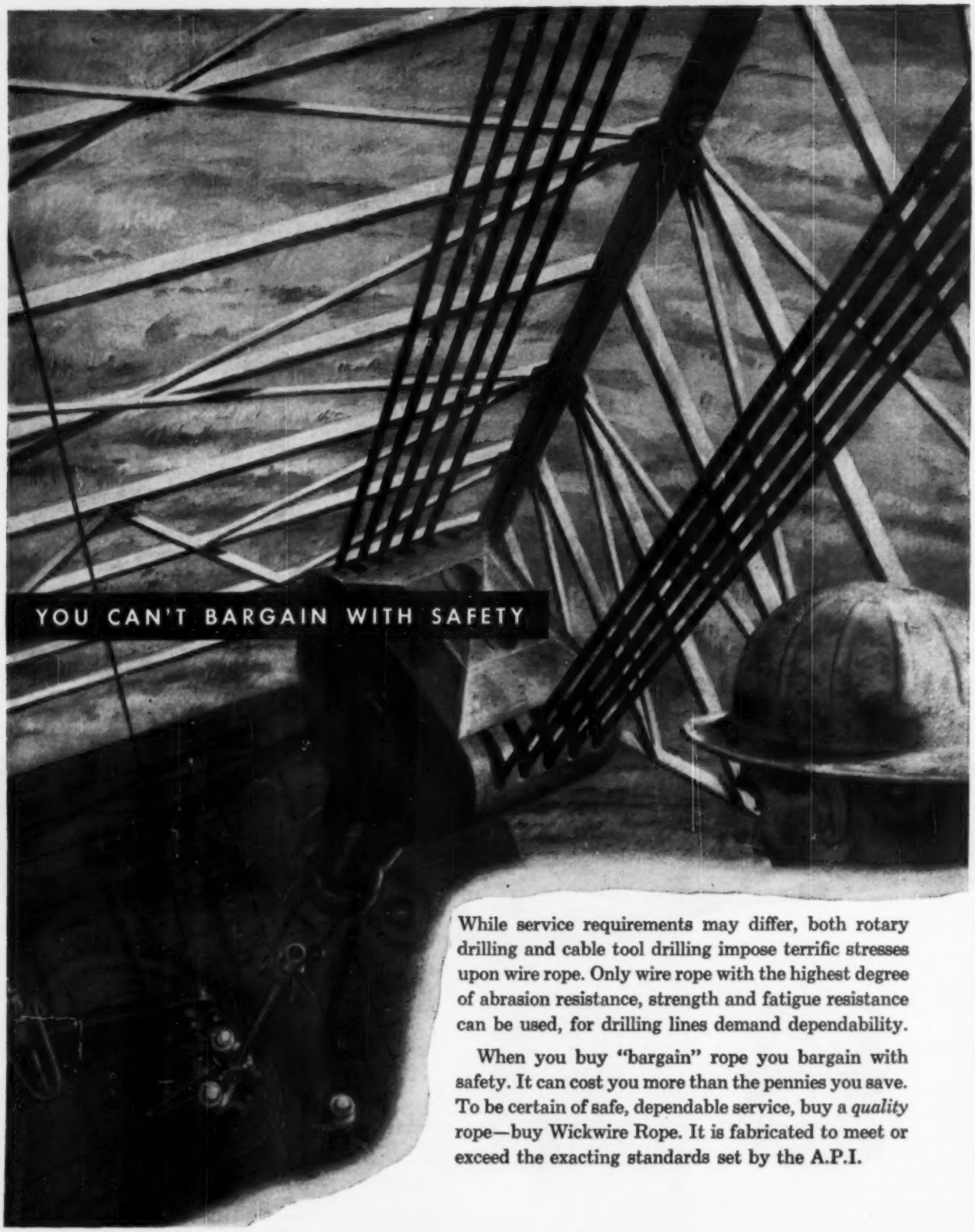
Fig. G Variable FILL-UP Valve as used in FLEXIFLOW Equipment.

Fig. H Variable FILL-UP Valve as used in DIFFERENTIAL Equipment.

Baker Fill-Up Equipment saves time in running casing, but does not create pressure surges that reduce productivity.

Destructive pressure surges – often created when casing equipped with conventional floating equipment is lowered into the well – can now be avoided. The Variable Valve in either Baker DIFFERENTIAL or Baker FLEXI-FLOW "Fill-up" Shoes and Collars, permits casing to fill from the bottom up; eliminates expensive, time-consuming surface filling; and automatically coordinates the *rate of fill* with the *rate of lowering* to AVOID high pressure surges. Baker FILL-UP Equipment permits the casing to be lowered at normal rates, saving rig time and reducing danger of sticking the pipe; chances for successful primary cementing are increased; formations are protected from high pressure surges which can impair their productivity.

For SAFETY in oil field operations.

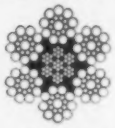


While service requirements may differ, both rotary drilling and cable tool drilling impose terrific stresses upon wire rope. Only wire rope with the highest degree of abrasion resistance, strength and fatigue resistance can be used, for drilling lines demand dependability.

When you buy "bargain" rope you bargain with safety. It can cost you more than the pennies you save. To be certain of safe, dependable service, buy a *quality* rope—buy Wickwire Rope. It is fabricated to meet or exceed the exacting standards set by the A.P.I.

. . buy WICKWIRE ROPE

ROTARY DRILLING LINES



6 x 19 Seale Construction—"Wisscolay" Preformed
6 strands—19 wires to the strand
1 fiber core or 1 Independent Wire Rope Core (IWRC)

Wickwire's 6 x 19 Seale Construction with either IWRC or fiber core gives excellent service under severe conditions encountered in rotary drilling.

These ropes are supplied "Wisscolay" Preformed to provide better bending life over multiple-reeved blocks. The rope's relaxed condition also reduces whipping and allows more uniform winding on the drum.

The IWRC construction should be used if a line is subjected to crushing on the drum. This Wickwire construction provides maximum core support with a minimum of strand-to-core nicking. Crushing forces are uniformly transmitted to the very center of each strand. This allows the individual wires to resist displacement which occurs in some other constructions.

These ropes are available in three grades: Double Gray Extra Improved Plow Steel; Gray Strand Improved Plow Steel; Plow Steel.

CABLE TOOL DRILLING LINES

6 x 21 Filler Wire Construction
6 strands—21 wires to the strand
1 fiber core

This construction was adopted by Wickwire for Cable Tool Drilling. The size and number of outer wires provide the ideal balance between resistance to abrasion and ability to withstand bending over sheaves.

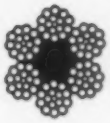
The steel which goes into Wickwire drilling lines is carefully selected and every subsequent stage of manufacture is closely controlled. Drilling lines are an item of considerable expense to the drilling contractor and this careful quality control assures the users of longest possible rope life.

The fiber core used in Wickwire Cable Tool Drilling Lines is also specially selected to withstand the rigors of this very severe wire rope application.

Wickwire 6 x 21 Cable Tool Drilling Lines are available in three grades: Gray Strand (Improved Plow Steel), Plow Steel, and Mild Plow Steel.

OTHER WICKWIRE ROPES FOR OIL FIELD USE

"WISSCOLASTIC" DRILLING LINE

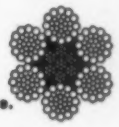


6 x 21 Filler Wire Construction
6 strands — 21 wires to the strand
1 fiber core.
Increased elasticity provides faster, smoother drilling, better absorption of shock loads, less vibration and whipping.

SAND AND CORING LINES

6 x 7 Construction—"Wisscolay" Preformed
6 strands—7 wires to the strand
1 fiber core.

TUBING, SUCKER ROD OR WINCH LINES



6 x 31 Seale Construction
"Wisscolay" Preformed
6 strands—31 wires to the strand
1 fiber core or 1 Independent Wire Rope Core.
Recommended for better winding and increased freedom from twisting.

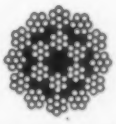
TORPEDO LINES

"Wisscolay" Preformed

5 x 5 Construction
5 strands—
5 wires to the strand

5 x 7 Construction
5 strands—
7 wires to the strand

TUBING OR SUCKER ROD LINES



18 x 7 *Non-Rotating* Construction
"Wisscolay" Preformed
18 strands—7 wires to the strand
1 fiber core.

Designed so a single part line can pick up an unguided load without causing load to spin. Outer and inner layers are twisted in opposite directions to counteract rope's tendency to unlay under pressure.

TAPERED DRILLING LINES

To eliminate excessive weight, lines are small at tool end and larger at drum end to support weight of cable and tool. Individually designed and manufactured to specific requirements. Write for information.

SOLID PLASTIC CORES

A core made from a specially developed plastic is available in Wickwire Drilling Lines which are required to operate under unusually severe conditions. This core is highly resistant to the damaging effects of acids and other corrosive fluids frequently encountered in the oil and gas fields.

LOOK FOR THE YELLOW TRIANGLE

Note: Wickwire manufactures Extra Improved Plow Steel rope under the name Double Gray. This rope, with a catalog breaking strength 15% higher than the catalog breaking strength of Improved Plow Steel ropes, is recommended for applications where maximum tensile strength is the prime requirement. Wickwire achieves this high strength with no loss of fatigue resistance or other important qualities.

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Denver • El Paso Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln (Neb.) • Odessa (Tex.) • Oklahoma City • Phoenix • Pueblo Salt Lake City • Tulsa • Wichita • PACIFIC COAST DIVISION—Los Angeles • Oakland • Portland • San Francisco • San Leandro Seattle • Spokane • WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) New Orleans • New York • Philadelphia

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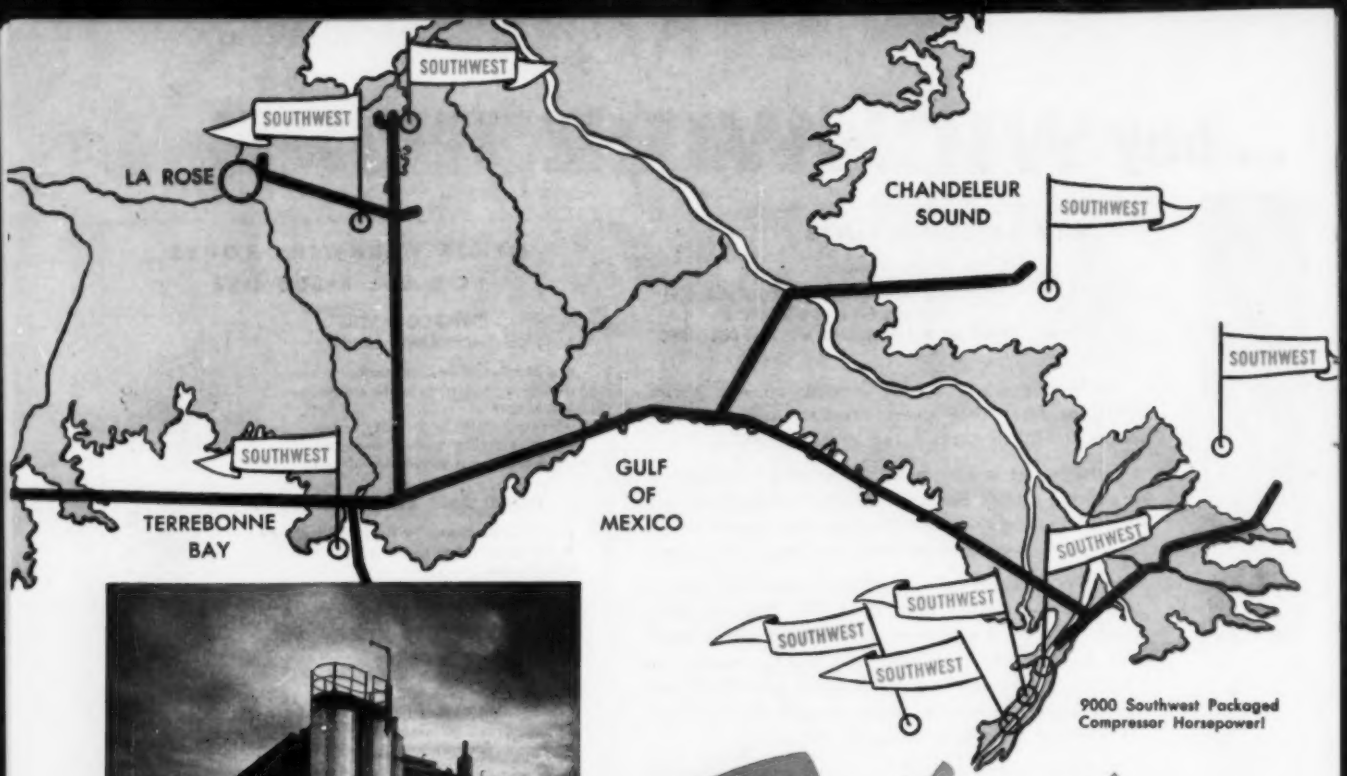
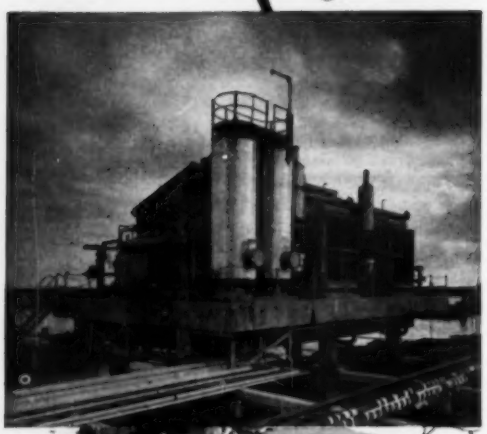
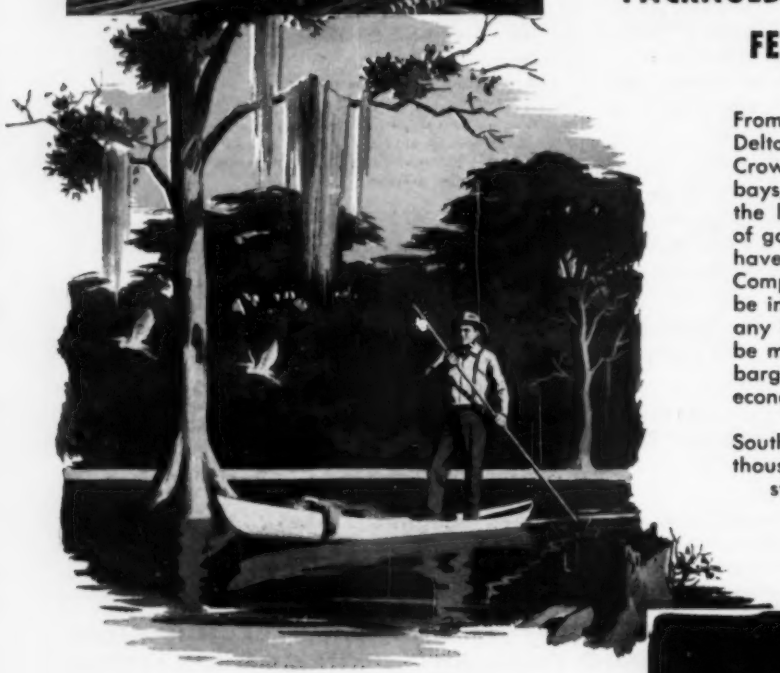






Southwest

PACKAGED GAS COMPRESSORS FEEDING "THE MUSKRAT LINE"

From the South Pass area of the Mississippi Delta west for almost 400 miles to Crowley, La., the Muskrat Line lies in swamps, bays, and marshes. Eighty per cent of the line lies underwater! To boost the pressure of gathering lines feeding into it, five majors have turned to Southwest Packaged Gas Compressor Plants. These Southwest units can be installed in any location to do any compressing job. These balanced units can be mounted on piling, concrete platforms, barges, or wherever necessary for most economical installation and operation.

Southwest plants are saving gas producers thousands of dollars in the rugged swamp country of South Louisiana through low installation and low operating costs. Available in sizes from 265 hp to 660 hp.

FOR GAS LIFT, GAS BOOSTER, PRESSURE MAINTENANCE AND SIMILAR PROJECTS.

SOUTHWEST INDUSTRIES, INC.

P. O. Box 19392, Houston 24, Texas

A new kind of swab is coming your way!

Here's the handiest combination of efficiency and flexibility ever developed in a tubing swab. The BJ Hydrodynamic Swab has a simple, two-piece body and a pair of either of two types of rubbers that fit onto it. This is all you need for any kind of swabbing job that comes your way. There is less to buy, fewer parts and accessories to fool with. Yet, you'll be able to swab faster, with greater recovery, and with fewer rubber changes.

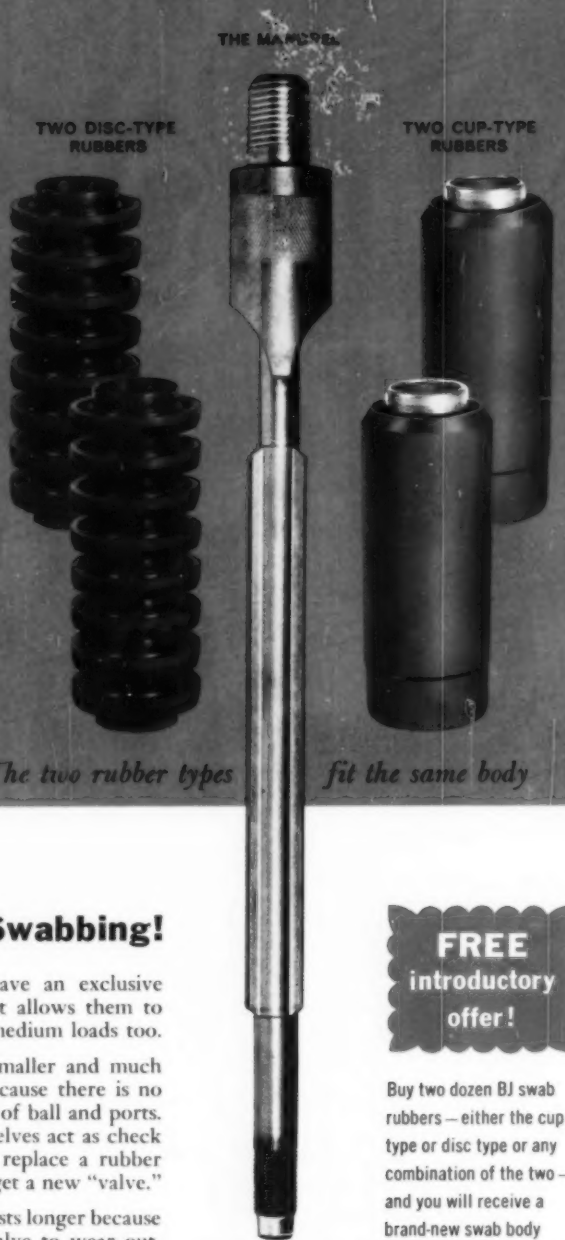
YOU BUY LESS
BECAUSE YOUR BJ SWAB
DOES MORE!

BJ TUBING SWABS

FREE INTRODUCTORY OFFER
See other side

With the new BJ Tubing Swab

THIS IS ALL YOU NEED FOR ANY SWABBING JOB



The two rubber types fit the same body

Better, Faster, More Economical Swabbing!

VERSATILITY. There is complete interchangeability of the two rubber types. One steel body serves for both. You simply unscrew the guide nut, let the rubbers slide off, and slip the replacements on.

LOW COST. There's but one swab body to buy and two sets of two swab rubbers, and you're all set for any kind of tubing swabbing operation. Less to buy, less to stock, yet you're fully prepared for any job.

FASTER FALLING. No ports to cause drag. On descent, rubbers fit loosely inside tubing; when the swab is pulled up, the rubbers expand to form a positive seal. You get in and out of the tubing in a hurry.

BETTER SWABBING. BJ swab rubbers are designed to pull the greatest possible loads – yet they have an exclusive flexible feature that allows them to adjust to light or medium loads too.

ADVANCED DESIGN. Smaller and much easier to handle because there is no bulky arrangement of ball and ports. The rubbers themselves act as check valves. When you replace a rubber you automatically get a new "valve."

LONGER LIFE. Body lasts longer because there's no check valve to wear out. Rubbers last longer because of the fact that there's a clearance between the tubing and the descending rubbers.

POPULAR TUBING SIZES. In each of the two rubber styles there are sizes for 2", 2½", and 3" tubing. The two larger sizes are interchangeable on a single swab body.

FREE introductory offer!

Buy two dozen BJ swab rubbers – either the cup type or disc type or any combination of the two – and you will receive a brand-new swab body **absolutely free!** This offer is for a limited time only, so don't miss out. See your favorite supply dealer or your BJ field man today.

Sold through your supply store.

WATCH BJ FOR THE NEWEST

Byron Jackson Tools, Inc.

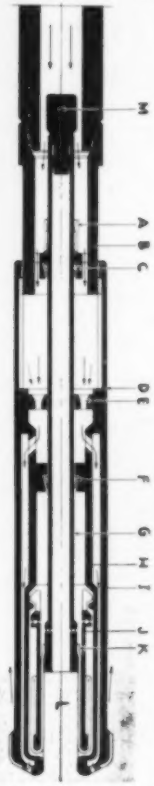
A SUBSIDIARY OF BORG-WARNER CORPORATION

P.O. Box 2017A, Terminal Annex, Los Angeles 54, California • Cable: "BJTOOL"
Export Address: 580 Fifth Avenue, Suite 510, New York 36, New York

PRINTED IN U.S.A.

Rubber Sleeve Core Barrel

270 A rubber sleeve core barrel has been designed by Christensen Diamond Products to provide the analyst with higher quality cores. The tool obtains continuous, undisturbed core in unconsolidated formations, conglomerates or badly fractured rock, holds loose core together, protects core from damage caused by moving fluid, and packages unconsolidated core so that it can be handled and transported with a minimum amount of disturbance.



The barrel consists basically of an outer barrel (I), an intermediate barrel (H), a loading tube or inner barrel (J), and a stripper tube (G). The rubber sleeve (K) is loaded on the loading tube and attached to the end of the stripper tube. Stripper tube is held in place by 2 ratchets (C and F) which are alternately constricted and released during coring operations. Springs are activated by the expansion joint (B). Prior to coring the stripper tube is latched down by latch (A) which is released by a release plug (M) when coring commences. Source of weight for cutting the core is provided by the circulating fluid which exerts pressure on the nozzle plate (E).

Diameter of the barrel is 6⅞ in. OD and 3 in. core size. Barrel is available in 38 ft lengths and takes a 20 ft core. Diamond bit size ranges from 7½ in. OD to 9⅝ in. OD. *Christensen Diamond Products Company.*

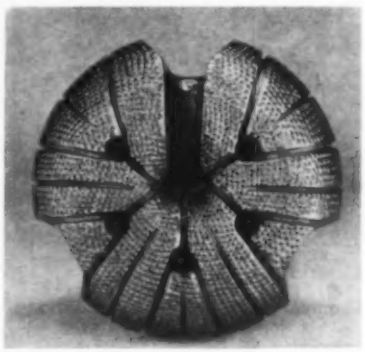
Drilling Mud Dispersing Agent

271 Mudlax is a new Dowell product used to penetrate and disperse clay base drilling muds, to remove mud filter cake from the face of the formation, to remove large quantities of mud lost to the formation, and to free stuck drill pipe. The product acts to oil-wet the clay particles in drilling muds and to drive off part of the water that has caused the clay to swell. This rejected water, and the clay particles themselves, are then dispersed in the oil and removed from the well. It works equally well on natural muds, Aquagel muds, high and low lime muds and oil-emulsion muds. Field results have shown Mudlax to be especially effective on certain types of soap-oil-emulsion muds. *Dowell Division, Dow Chemical Company.*

Slotted Diamond Drill Bit

272 A new diamond drill bit has been introduced by Hycalog, Inc. Called the "V-Door," it incorporates a concept in bit design which has been developed for making long runs in hard formations.

In order to prevent plugging of the



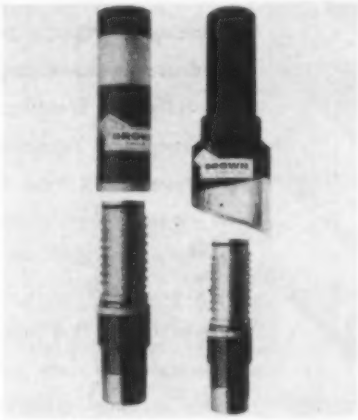
center section, the bit actually cuts a small core. Then, by a combination of hydraulics and bit design, the core is broken off in short segments and washed through the V-door slot out of the hole. *Hycalog, Inc.*

Roller Bits for Air Drilling

273 With the use of air and gas as a circulating medium in drilling deep wells started in 1954, Reed Roller Bit Company began work in special-design bits for air drilling. Final product of this work is the new Y-Cobra bit for air drilling. This bit is of the tungsten-carbide insert type and has established an impressive record in the field. Ten of the bits drilled 40,118 ft of hole in 1111 hr with weight on bit ranging from 20,000 to 40,000 lb and rpm from 44 to 65. *Reed Roller Bit Company.*

Criss-Cross Safety Joint

274 A safety joint which affords right hand release and right hand re-engagement for retrieving fish has been developed by Brown Oil Tools. The lower pin end is provided with a cc (criss-cross) right and left hand thread to permit right hand re-



lease. A trip with the retrieving head which has right hand threads permits re-engagement with the fish by right hand rotation. Mating threads make the connection stronger than a conventional overshot.

The hazard of premature releasing with a strain on the fish while rotating is eliminated. In the event stuck fish cannot be retrieved, the retrieving head has the safety joint feature in that the retrieving head can be released by left hand rotation. *Brown Oil Tools, Inc.*

Chain Tongs and Spinning Chains

275 Introduction of a new line of chain tongs and spinning and cathead chains has been announced by Bettis Corporation. Tongs are of the same design as other regular single end chain tongs. Jaws are drop-forged of high quality steel, hardened and tempered to insure longer wear. Chains and pins also are heat-treated. All parts —handles, jaws, chain and bolts—are interchangeable with all other regular single end chain tongs. The line is complete in sizes of 11, 12, 13, 13½, 14, 15, and 16.

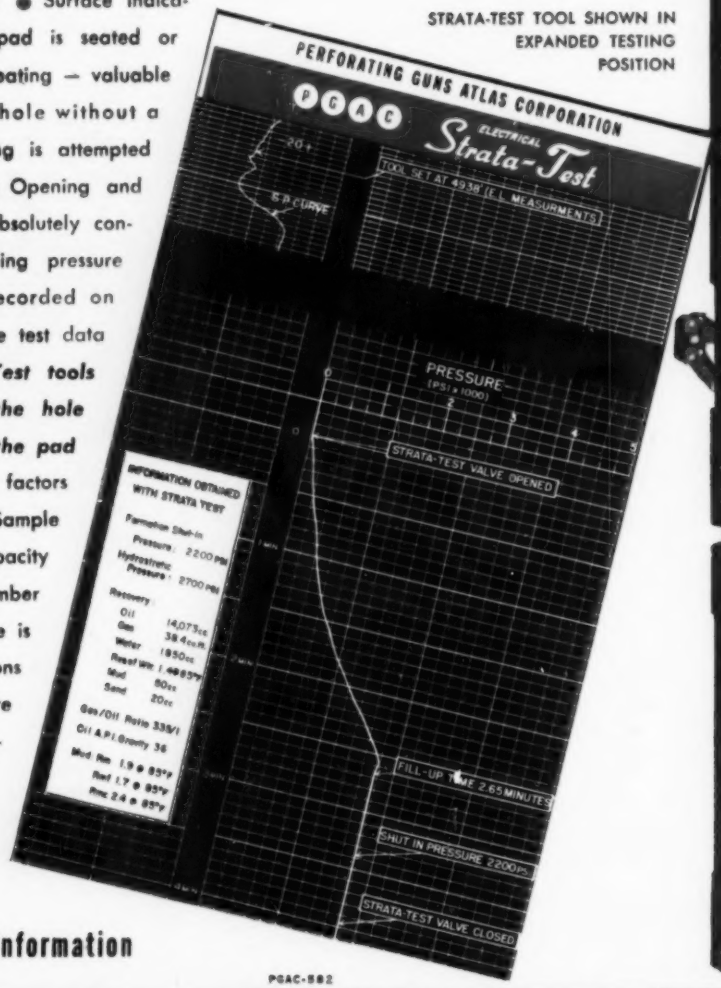
Steel spinning and cathead chains are of the same quality as the chain tongs — hardened and tempered to assure strength and durability. Chains are fitted with connecting links packed in strong metal edge boxes. They are available in any length. *Bettis Corporation.*

Strata-Test...

the Sure and Safe, Quick Way to test formations by wireline

Here's WHY it is more dependable:

Positioning of PGAC's Strata-Test tool in the hole is pin-pointed by correlating its S.P. with the S.P. of a previously run Electrical Log and Micro Survey. ● Seating and retracting of sealing pad is completely controlled from surface. ● Surface indication reveals whether sealing pad is seated or tool fully extended without seating — valuable knowledge if tool is run in hole without a previous caliper log and setting is attempted in an enlarged hole area. ● Opening and closing of sampling valve is absolutely controlled from surface. ● Sampling pressure during test is continuously recorded on surface log — providing complete test data for reservoir study. ● ***Strata-Test tools have never been stuck in the hole because of failure to break the pad seal*** — due to unique safety factors provided for this purpose. ● Sample chambers of 1, 5 or 6 gallons capacity are offered. When the 6-gal. chamber is run, the last gallon of sample is isolated from the first five gallons — which helps to give a more representative sample of formation content.



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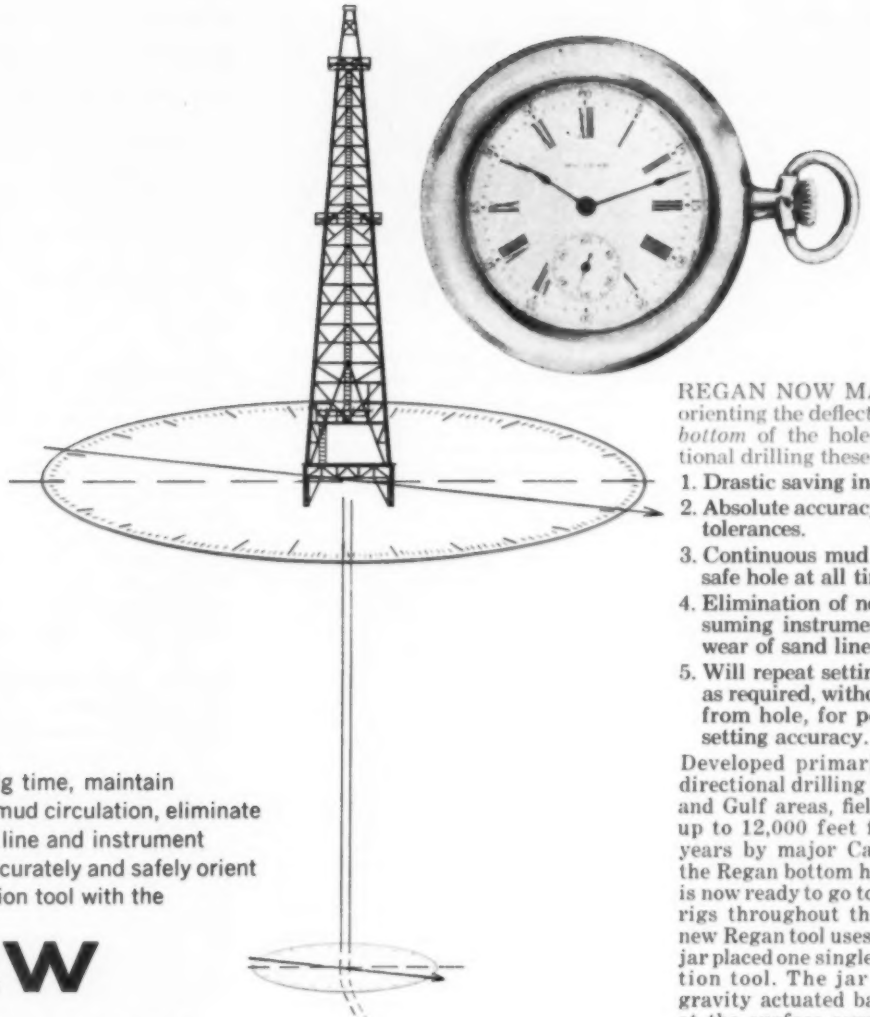

Now—cut rig time, maintain continuous mud circulation, eliminate use of sand line and instrument while you accurately and safely orient your deflection tool with the

NEW REGAN BOTTOM HOLE ORIENTING SUB

REGAN NOW MAKES practical orienting the deflection tool from the *bottom* of the hole, bringing directional drilling these advantages:

1. **Drastic saving in rig time.**
2. **Absolute accuracy within required tolerances.**
3. **Continuous mud circulation for a safe hole at all times.**
4. **Elimination of need for time-consuming instrument runs, use and wear of sand line.**
5. **Will repeat setting as many times as required, without removing tool from hole, for positive check on setting accuracy.**

Developed primarily for offshore directional drilling in the California and Gulf areas, field-tested in holes up to 12,000 feet for nearly three years by major California drillers, the Regan bottom hole orienting sub is now ready to go to work on drilling rigs throughout the industry. This new Regan tool uses a pre-set splined jar placed one single above the deflection tool. The jar is tripped by a gravity actuated ball, and indicates at the surface correct tool orientation by shortening the drill string the length of the jar. *At no time does the ball support any weight which would bind its movement or damage its race.*

The new Regan bottom hole orienting sub now offers drilling operators of all types speed and accuracy of deflection tool orienting that will save rig time and provide dependable hole insurance through its design that permits continuous mud circulation during orienting.

For complete information on this new tool write:

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Quality - Wrought on the Forge of Experience

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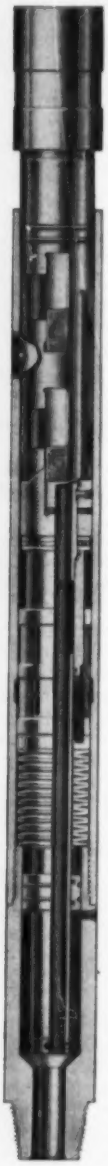
Bumper Sub and Safety Joint Combined

276 A compact unit providing the advantages of both a bumper sub and a safety joint has been developed by S. R. Bowen Company. It will deliver heavy downward blows in the drilling string for bumping through formation bridges, for working out of key seats, for drilling through caving, heaving and sticky formations, or it can be disengaged to salvage all string above it. Its presence in the string permits working the pipe to free the bit or drill collar should they stick in the hole and, being a combination tool, permits the operator to disengage and re-engage in the hole.



In the hole, the tool is securely locked against both torsional and axial vibration. A bath of oil minimizes wear on internal working parts and reduces servicing operations. Top and bottom sealing enables the tool to transmit circulating fluid at high pressure without contact between the well fluid and the working parts. Accidental separation of the safety joint is prevented by retaining pins. Space for fluid circulation and the running of wireline equipment, core barrels, survey instruments and similar items through the tool is assured by the large circulation hole in the tool. By replacing the bowl plug with the locking plug, the operator can lock out the safety joint feature of the tool. *S. R. Bowen Company.*

Portable EP Mud Tester

277 Baroid's portable EP mud tester is a new item developed as a portable field instrument for on-location determination of the extreme pressure lubricating properties of a drilling fluid. The tester gives a measure of the property of a drilling fluid to prevent bearing seizure under conditions of high load.

The test consists of applying controlled known pressures to bearing surfaces consisting of a stationary polished

steel block and a rotating polished steel ring. Both the block and ring are bathed in the test sample of drilling fluid. The amount of pressure applied to these bearings surfaces for a specified time interval is converted to numerical units that indicate the lubricating properties of the drilling fluid. The tester is a compact unit weighing approximately 50 lb and is powered by a motor operated from 110-v, a-c or d-c power. *Baroid Division, National Lead Company.*

Tungsten Carbide Section Mill

278 Developed by Servco, a new section mill utilizes a process which suspends tungsten carbide particles in a tough, elastic matrix, so that hundreds of cutting edges are always in contact with the surface to be cut. As particles are worn away or torn from the matrix, new cutting edges are automatically exposed. There is ample material on the cutter arms to cut a complete window with one set of arms.

Cutter arms are easily replaced by removing lock screws and driving out cutter arm retainer pins. Pump pressure moves a piston, which expands the cutting arms against the casing. *Servco Corporation.*

Bottom Hole Orienting Sub

279 Regan Forge & Engineering Company is introducing an improved method of orientation of deflection tools used in directional drilling. The method uses a pre-set splinted jar placed one single above the deflection tool. The jar is tripped by a gravity actuated ball, and indicates at the surface correct tool orientation by shortening the drill string the length of the jar. The orienting sub will repeat, permitting orientation of a tool as many times as required. Successive deflection runs can be made without pulling the pipe out of the hole. Wire line is eliminated, permitting leaving the kelly in place to establish circulation. *Regan Forge & Engineering Company.*

Hydraulic Jet Fishing Tool

280 A new fishing tool which retrieves junk through a hydraulic jet action will be made by the Nedow Oil Tool Company. The design of the tool enables it to pick up solid cone bits, bearings and other heavy objects without junk shots.

In operation, the tool is fitted to a drill collar and lowered into the hole while fluid is circulated. Fluid, passing down through the tool, is forced out through 4 jet holes into the space between the tool and the side of the hole.

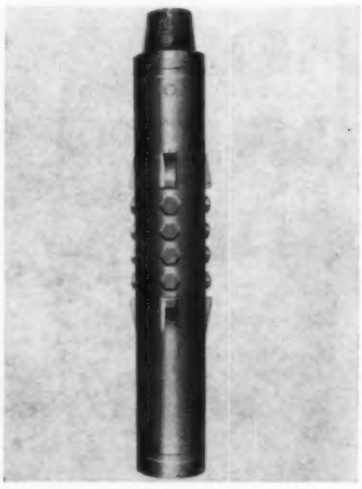
From there the fluid goes down to the cutting mill at the bottom. The rotating mill grinds up the junk, while its teeth carry the junk to its center, where pressure of the fluid flow carries the junk up through a slotted hard rubber cone into the internal basket. The slotted rubber cone allows the junk to enter the basket, then snaps closed again. Fluid circulates back up through the tool and through the annulus between the bore hole and the drill collar. *Nedow Oil Tool Company.*

Double Pipe Wiper Of Solid Rubber

281 Skinner Bros. Company has announced a new double pipe wiper which is manufactured entirely of rubber in 1 piece and contains no metal. It can be used in either air or mud drilling and does not have to be cut for pipe sizes since it is available in a complete range of sizes from 14 in. by 2 and 3 in. to 17 to 19 in. by 4¼ and 5 in. Field use demonstrates that the double pipe wiper has exceptionally long life. *Skinner Bros. Company.*

Hard-Faced Button Stabilizer

282 A new stabilizer has been developed by Eastman Oil Well Survey Company which incorporates several new advantages. Buttons of



mild steel, hard-faced with tube borium to insure long wear, are threaded into the stabilizer body with a hexagon socket wrench. Star-type spring steel locks are used under the buttons to prevent loosening in service, and left-hand threads are used so that the buttons will not back out should it become necessary to wash over.

The buttons are easily removed and replaced, making the stabilizer easy to field-dress. Buttons are placed in straight rows to permit maximum annular velocities, and are also staggered to prevent tracking and undercutting. Space between the buttons provides a self-cleaning action and minimizes the tendency to ball-up. *Eastman Oil Well Survey Company.*

Directional Drilling Assembly

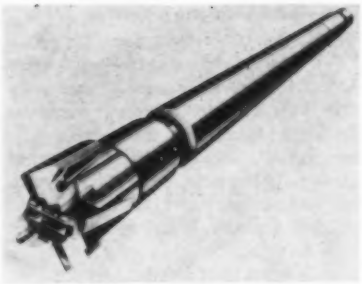
283 A development for use in controlled directional drilling in soft formations is being offered by Eastman Oil Well Survey Company, under the name of Badger Jet. The Badger Jet drilling assembly consists of a 2-cutter rock bit with 2 different sizes of jets, the larger jet being modified for orienting and maximum jetting action. The assembly drills a full-gage hole, and can be re-oriented at any time with the Eastman orientation instrument without coming out of the hole, affording maximum directional drilling pene-

tration rates. The drilling assembly introduces the angular change into the bore hole at a uniform rate of curvature, minimizing key-seat problems. *Eastman Oil Well Survey Company.*

Percussion Drilling Tool

284 A new drilling tool is introduced with the Schramm Rotatool, a percussion tool that does its work at the bottom of the hole. The new tool, developed for use with Schramm Rotadrills, is simple in design, having only 3 moving parts. Since percussive action is contained within the tool, no power is lost through the drill pipe. A special bit equipped with 6 carbide tips is designed for maximum life and can be reground on the job.

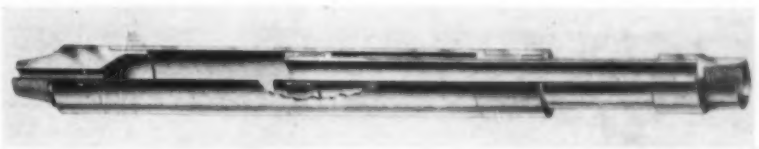
The tool is available in 2 models. No. 3875 takes a 4½-in. bit and requires



100 cu ft per min of air at 100 psi to operate. The larger size, No. 5250, takes 6 in. and 6½-in. bits and requires 350 cu ft per min of air to operate. *Schramm, Inc.*

Permanent Tong Torque Installation

285 Martin-Decker offers a relatively new type installation for its tong torque gage. This permanent installation places the indicating head in the weight indicator box. The cylinder is attached to the derrick leg or back-up post and the back-up or snub line is attached to the cylinder. Every time the back-up tongs are used the driller has in front of him the make-up torque applied, whether to drill pipe, tubing, or drill collars. Target pointer on the head can be set to the desired torque and the damper adjusted to give the proper sensitivity to the pointer. *Martin-Decker Corporation.*



Hydraulic Drill Collar

286 The Grant Oil Tool Company has anounced a hydraulic drill collar for cushioning vertical shocks of hard formation drilling. The new tool, called the Fluidrill, utilizes a simple hydraulic system to use the drilling mud to transmit the weight of the drill collars to the rock bit. The telescoping barrel of the Fluidrill maintains a constant weight on the bit and provides free vertical motion between the rock bit and drill string which prevents detrimental vibrations in the drill string from reaching the rock bit. In addition, the tool enables the driller to maintain a known constant weight on the bit independent of the tendency for drill pipe to hang on the side of the hole, causing the weight indicator to register incorrectly. *Grant Oil Tool Company.*

Geological Tools

Ultra-Violet Light Inspection Cabinet

287 A new inspection cabinet for fluorescent analysis has been introduced by Ultra-Violet Products, Inc. The cabinet offers short wave ultra-violet, long wave ultra-violet, and white light in a lightweight enclosure. It can be operated on batteries for field use or on 110-v, a-c, or d-c, in field or laboratory. *Ultra-Violet Products, Inc.*

Cone Type Rock Bit

288 Herb J. Hawthorne, Inc., has added a new cone-type rock bit to their line of all-formation bits for seismic shot-hole drilling. Designed for either air or water drilling of medium through extremely hard abrasive formations, the 3-cone bits will be available in the most popular fractional sizes from 3⅞ through 5⅝-in.

High hardness steel alloy, with superior wear resistant properties after heat treating, is used in the cone and head forgings, and a special hard-facing process bonds a combination of tungsten carbides and other high abrasive resistant alloys to the steel. Rock bit adapter subs made of 41-40 heat-treated steel with polished threads are also available, with or without breakout lugs, to fit all standard threaded connections on equipment commonly used in the seismic exploration industry. *Herb J. Hawthorne, Inc.*

Blast Hole Drilling Rig

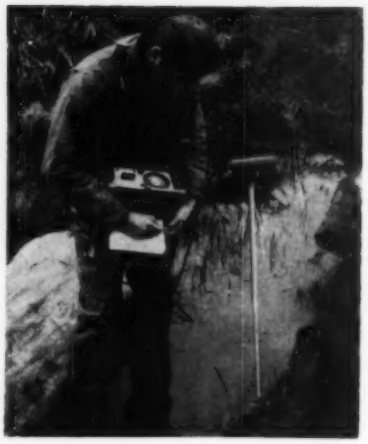
289 A new portable rotary drilling rig has been announced by the George E. Failing Company. The rig is recommended for drilling blast holes, taking cores, soil sampling and other foundation work. The unit is mounted on a truck with a diesel engine. The truck engine furnishes power for the rotary table. The air compressor on the rig is powered by a diesel engine, with hydraulic full load governor.

The rig is designed to use both conventional type rock or drag bits and also new down-the-hole tools. Three hydraulic leveling jacks are standard equipment on the unit. *George E. Failing Company.*

One-Man Magnetometer

290 One of the latest tools for geologists and geophysicists is Varian Associates' M-49, a new 1-man portable magnetometer. The unit measures the total intensity of the earth's magnetic field. Because it can detect changes in the field, caused by varying sub-surface geological structures and mineral deposits, it has many applications to prospecting. It is said to be as easy to operate as a radio and accurate under the most rugged conditions.

Weighing only 16 lb, the unit is battery powered permitting operation in remote areas and eliminating problems associated with differing world-wide line voltages and frequencies. *Varian Associates.*



Well Services

Barrier Type Shaped Charge

291 A new barrier type shaped charge that enables the operator to place fractures where he wants them has been introduced by Jet Research Center, Inc. Known as Frac-Jet, the charge is used in a pattern of 8 jets placed at 45 deg phasing and fired simultaneously. It is available in a 4⅜-in. size for use in 5½-in. casing.

Although Frac-Jet was designed as a fracture placement tool to be used in cased holes, it has also been used successfully in open hole. Since the operator has the selectivity of placement, it is particularly successful in thin zone completions and in squeeze cementing operations. Average performance values for each of the 8 shots when fired into a composite target consisting of 5½-in., 17 lb per ft, N-80 casing backed up with 16 lb per gal neat cement containing 1 percent bentonite and aged 16 days, are 9 in. depth of penetration with ⅜ in. diameter entrance hole. *Jet Research Center, Inc.*

Tubing Caliper Service

292 Otis Engineering Corporation has announced its newly-developed "surface" caliper survey service designed to detect defective joints in either new or used tubing before the pipe is run into a well. The service is especially recommended for surveying tubing that will be set in corrosive, high-pressure wells.

Surveys can be conducted in the customer's pipe yard or on the lease. A special calipering instrument is drawn through the joint to determine the internal condition of the pipe. Feelers on the caliper are in constant contact with the inside wall of the pipe, and as a corrosion pit or a reduction in wall thickness is encountered, outward movement of any one of the feelers causes an electrical signal to be transmitted to a strip-chart recorder. Internal condition of the pipe is logged, and each joint classified and color-coded accordingly. Pipe can also be cleaned internally and/or drifted if desired. After the lot is surveyed, an engineer compiles a detailed, permanent report on the classification of each joint. *Otis Engineering Corporation.*

New Service Cleans Well Bore Area

293 Heatblast is a new Dowell service created to clean production deposits from the critical wellbore area. Deposits which are commonly found in old producing wells generally consist of several minerals such as paraffin, asphalt, gilsonite, quartz, salt, calcium carbonate, and calcium sulfate. Heatblast, with its supply of abundant heat, can be designed with various additive chemicals to attack most any deposit present.

Treatments basically are composed of a gel carrier in which suspended magnesium pellets have an extremely large surface area per pound of metal and an acid base reaction liquid. The proper hydrocarbon solvent can be incorporated with the carrier and special scale solvents in the acid reaction liquid. The recommended treatment gives off sufficient heat to increase the treating fluid temperature approximately 200 F. Returned fluids show the value of the heat, which is released suddenly, in removing heavy hydrocarbon and scale deposits. The heat also aids in the reaction of the acid-chemical solution on scale deposits which may be intermingled with or coated by heavy hydrocarbons. *Dowell Division, Dow Chemical Company.*

Small Diameter Expendable Perforator

294 Design changes have enabled Schlumberger to build an expendable perforator with diameter restricted to 1⅜ in., but with performance matching that of larger diameter models. The perforator was designed to pass through 1½ in. production tubing and perforate full size casing. The perforator fires shots in 2 directions with a spacing of 6 shots per ft. A magnetic collar locator, redesigned to the 1⅜-in. diameter, assures accurate depth control.

Design changes feature a new firing system in which the primacord has been eliminated in favor of a series or chain-firing system. Initiation of successive charges is accomplished by short primer tubes between charges.

Large gun-to-casing clearances have been eliminated by a magnetic orienting tool which automatically aligns the gun in an eccentric position with charges directed toward the adjacent casing. Near optimum clearance, and hence maximum penetration, is obtained on all shots in all casing sizes from 4 to 7 in. in diameter. *Schlumberger Well Surveying Corporation.*

Dallas Firm Claims World's Deepest Slim-Hole Pumper

The world's deepest slim-hole pumper — a 5,000-foot oiler in Cochran County's Buckshot field —was reported completed Monday by Stekoll Petroleum Company, Dallas.

The well, Stekoll No. 1 J. W. Frost, 7-W-PSL, eight miles south of Bledsoe, gauged 139.8 barrels of oil plus 75 barrels of water a day on pump from around 5,140 feet. Slim hole wells produce through 1-inch hollow rods set in 2½-inch casing as opposed to normal casing size of 5½ inches.

M. H. Stekoll, president of the firm, said economy is the primary motive behind the slim well procedure. Savings from such techniques have reached as much as one-half normal costs in shallow depths and one-third in others, Stekoll claimed.

Since 1942, when he began water flooding work in the Bolton field near Independence, Kan., Stekoll has pioneered slim hole production.

Reproduced from the Dallas Morning News

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Epithermal Neutron Log

295 To provide a neutron log for quantitative evaluation of formation porosities, PGAC offers its new type PH-125 Epithermal neutrol log. The neutron instrument and associated recording instruments are calibrated by use of an environmental calibrating standard at the well site immediately before and after the actual logging operation.

The neutron instrument exhibits greater sensitivity to formation porosities than any other neutron instrument, yet exhibits no greater influence from variations in hole size and mud weight. In empty bore holes, the log retains high sensitivity to formation porosities. The effect of fluid salinity on the PH-125 neutron log is negligible for all practical purposes. *Perforating Guns Atlas Corporation.*

New Frac Service Offered

296 More oil from new and old wells in low permeability formations is being produced as a result of a wireline formation fracturing service called Vibro-Frac, introduced by Lane-Wells Company. The new service utilizes high frequency explosive shock waves to produce new fractures and extend old fissures. Applicable to cased or open holes, this fracturing method permits selective completion of separate zones.

For operations in cased hole, the zone of interest is normally perforated, using conventional perforators, with a shot density of 8 to 10 holes per ft. A special Vibro-Perforator which produces a 1½-in. diameter hole through the casing is used to place 1 or 2 large holes near the center of the zone of interest. After casing is perforated, the fracturing charge is lowered on an electrical wire line and positioned in the center of the zone. When the charge is fired, it produces a series of high frequency explosive shock waves. A total force of some 10 million ft-lb of energy exposes the formation to a series of vibrating forces. In the process of the explosion, some of the well fluids are injected into the resulting fractures at extremely high rates. *Lane-Wells Company.*

Perforator Adjusts to Casing Size

297 A versatile, expendable-type perforating tool for use in various casing sizes has been introduced by The Western Company. Trade name for the new tool is "J-II Slim Jet." By use of an arrangement in assembly of the gun, outside diameter of the tool may be set at 3⅜ in. for use in 4½ in. casing, 4½ in. for use in 5½ in. casing or 5 in. for use in 7 in. casing. The aluminum carrier mounts jet charges in fluid-tight aluminum cases in densities up to 4 per ft.

The hollow-tube carrier is preshaped to prescribed angles in the instance of the 3⅜ in. and 5 in. diameter assemblies, and is straight for the 4¼-in. assembly. By attaching the charge to the "inside" of the bends in the carrier, the smaller diameter is achieved, and the large diameter is attained with the charges attached to the "outside" bends.

The aluminum tubing and charge cases are virtually pulverized during firing. Junk is acid soluble and drillable. When fired above packers or retrievable plugs, a junk basket is used to remove debris from the hole. *The Western Company.*

Radioactivity Salinity Log

298 McCullough Tool Company announces a new adaptation of radioactivity logging which promises to be a major development in oil well logging — the radioactivity salinity log. The log will ascertain the relative salt concentration in porous intervals, aiding in evaluating correct depth to set casing, and can be used to determine water/oil and gas/oil contacts. In certain reservoirs, the log can be used for porosity determinations.

For an original completion, the log will indicate the relative amount of salt in each porous interval. This information can then be used in selectively choosing the intervals which indicate oil or gas production. The log can be run either in open hole or in cased hole. *McCullough Tool Company.*

Cementing Equipment

Cementing Float Shoes

299 Two new float shoes have been introduced by Rector Well Equipment Company. Known as the Type AP and the Type OP float shoes, each features internal parts of special aluminium alloy to provide greater impact, compression, tensile and shear strength than either concrete or bakelite.

The Type AP float shoe is designed for positive cementing in wells where there is a possibility of sticking the pipe on bottom. Shoe is approximately 3½ ft long and equipped with "side door" cementing ports, angled for proper distribution of cement. Ribbed aluminum nose guides the shoe past ledges and obstructions.

The Type OP constant control fill-up guide shoe is also designed for use in wells where there is a possibility of sticking the pipe on bottom. It differs in use from the AP in that the OP shoe is used in wells where formation conditions or bottom-hole pressures are such that the operator desires to stop running pipe and circulate the well, then resume running pipe with controlled orifice fill after circulating. *Rector Well Equipment Company, Inc.*

Gilsonite Cement For Lightweight Slurry

300 A new additive for cement slurry that lightens slurry weight down to 10 lb per gal and has excellent bridging properties for lost circulation problems is being introduced by Halliburton. The material, Gilsonite cement, is a solidified mineral processed in granular form for oilfield use. Almost as light as water (specific gravity is 1.07), it adds volume but not weight to the cement slurry and does not appreciably affect the setting characteristics of the slurry.

The cement has very low fluid requirements — each 50 lb needs only 2 gal of water. It is non-cellular in structure and even under pressure will not take water from a slurry. Each 100 lb of the material represents 2 cu ft of bulk volume. Compounded to make an 11 lb-per-gal slurry, the compressive strength after 24 hr at 100 F is 600 psi. However, a 10-lb slurry provides acceptable strengths for lost circulation cements in most areas. *Halliburton Oil Well Cementing Company.*

Well Completion Equipment

Dual Valve and Dual Tee

301 The McEvoy Company has introduced the first combination dual valve and dual tee, known as the Type DVT. The new combination completely eliminates one major flanged connection in a dual completion tree. The unit is available in models engineered to handle 3000, 5000, and 10,000 psi working pressure in sizes required by the industry. The 5000 and 10,000 psi WOG models have a flanged top while the 3000 psi WOG equipment is threaded for screw-type top connections. The DVT is full bore for complete vertical access to either tubing string for all wireline operations.

The lower flange is the same as in other McEvoy multiple bore valves. External lock screws provide a means of adjusting the packoff at any time during the life of the well, preventing communication between strings and comingling of fluids. Double master valves can be used by placing a regular dual flanged valve beneath the Type DVT dual valve with integral tee. *McEvoy Company.*

Long-Stroke Packer

302 HOMCO has announced its Type E packer. After the packer has been set, circulation can be established through its full-opening bore to clean the well. The 28-ft stroke allows spacing in the tubing head, eliminating the use of pup joints. The long stroke also allows movement of the tail pipe, permitting fluid flow to the bottom of the tail pipe either through the tubing or by reverse circulation.

An automatic bottom requires 7 to 8 turns to disengage and is easily re-engaged by raising the tubing string. Use of the automatic bottom eliminates the possibility of disengagement and premature setting. *Houston Oil Field Material Company, Inc.*

Cameron Introduces New Gate Valve

303 Two high strength alloy steel rings that rotate a fraction of a turn each time the gate is opened are the principal feature of the new Type "F" conduit gate valve being made by Cameron Iron Works, Inc. This rotating seat feature increases the life of the gate valve many times.

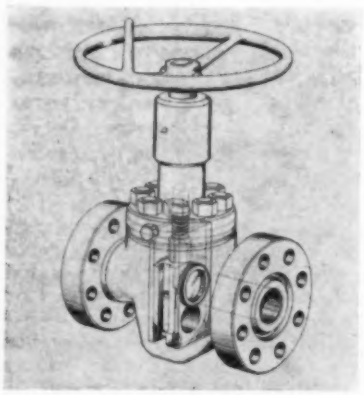
Rotation of steel seat rings exposes fresh metal to the erosive blast of line fluids during the time just as the port in the gate is uncovered on opening, or as the flow is being pinched off on closing. Wear is distributed over the entire sealing surface of the steel seat rings instead of being confined to a small area at the bottom of the seat.

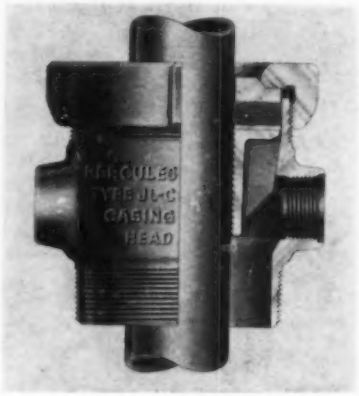
The valve also features a conduit type gate design, through-bored to provide a smooth flow-way in the open position.

A non-rising stem operates the gate and eliminates the need for a lower stuffing box. The stem is held to the stem adaptor by a pin so sized that if an overload torque is inadvertantly applied to the hand wheel, the pin will shear before the stem or other internal parts are injured. The stem is also equipped with a shoulder which may be jammed against a seat in the bonnet flange to seal off the stuffing box and permit changing stem packing while the valve is still under pressure.

The gate is of 1-piece construction which helps prevent line sediment from entering the body cavity and also makes it impossible to pressure lock the valve when the upstream pressure is bled off.

The gate valves are presently available with screwed or flanged ring joint connections and are also available in special body construction for dual and triple completion applications. *Cameron Iron Works, Inc.*





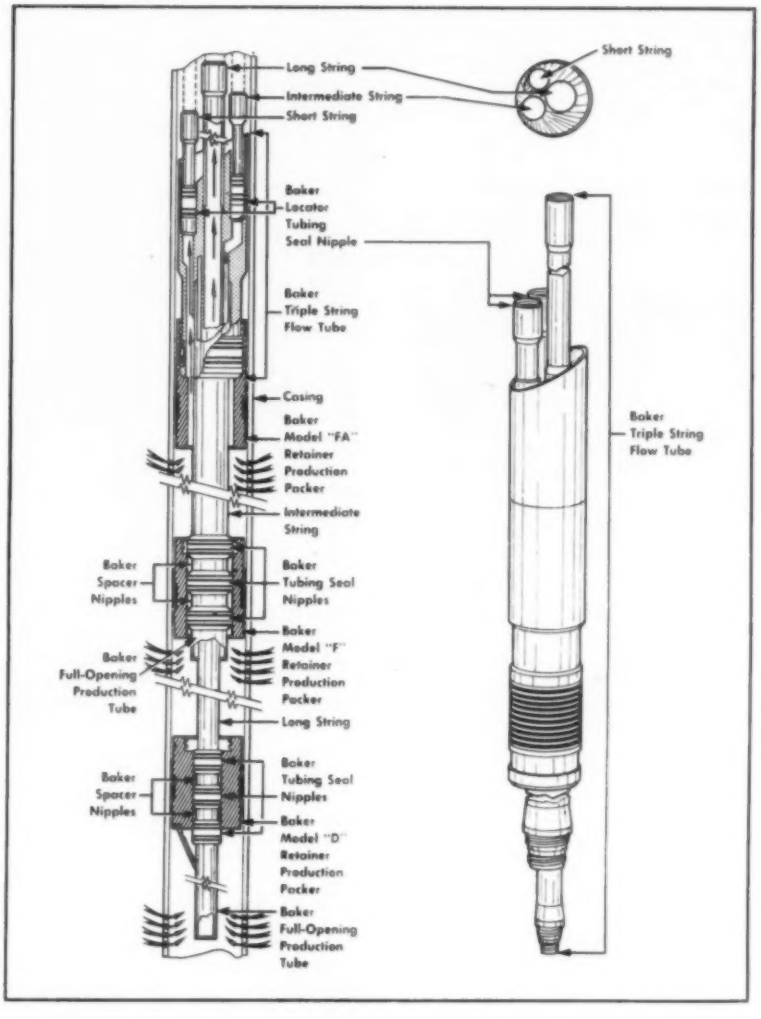
New Casing Head Series

304 To complement their well head line, Hercules Tool Company offers the Type JL-C series of casing heads in the 3000 psi test, 1500 psi working pressure class. These casing heads are ideal for wells of medium depth and pressure. All bodies are full opening and have cap threads which are adaptable to blow-out preventers, flanges, etc., and which allow drilling through the head after it is installed on the surface casing.

Bodies are constructed from one-piece pressure steel castings and every body is hydrostatically tested prior to assembly and the test pressure is stencilled into the body casing. Pack-off is above the slips and is accomplished by the compression of 2 neoprene packing rings between top and bottom metal packing rings. Heads are available in 8⅝, 9⅝, and 10¾-in. OD casing sizes with male or female threads, or slip-joint casing connections. Internal parts of 9⅝ and 10¾-in. OD sizes are interchangeable. *Hercules Tool Company.*

Tubing Head for Multiple Completions

305 A new tubing head introduced by Oil Center Tool Company permits the running of 3 parallel tubing strings in casing with 7⅝-in. OD. Quadruple completions are possible when used with larger casing. With the head, a single completion can be switched over to a dual or triple without installing another head. It is also possible to complete singly even though a second or third completion was originally scheduled. The head, known as the C-19-U, offers positive control throughout the completion operation as blowout preventers are not removed until all strings of tubing are in place in the well. *Oil Center Tool Company.*



Triple String Hook-Up for Multiple Completions

306 Parallel string hook-ups involving drillable retainer production packers have been introduced by Baker Oil Tools, featuring a new triple-string hook-up which permits separate production of three zones through tubing, and a possible fourth zone through the tubing-casing annulus.

The hook-up requires the use of three drillable retainer production packers. The lowermost packer is a conventional Model "D" retainer production packer. The middle packer is the new Model "F," which is similar to the Model "D" but contains a larger continuous bore for the same packer OD. The uppermost packer is the new Model "FA" retainer production packer that contains an even larger upper sealing bore. Each packer is run and set on wire line.

Heart of the hook-up is the Baker triple-string flow tube which contains a triple-string head with sealing bores for the short and intermediate strings and a threaded connection for the full-opening long string. The flow tube contains a lower seal unit assembly that seats and seals off in the upper sealing bore of the uppermost packer.

After setting the three packers, the lower end of the long string is made up to contain a production tube and the seal and spacer nipples required to seat and seal off in the bore of the lowest packer. The intermediate string is made up in a similar manner to seat and seal off in the bore of the middle packer. Both of these strings are made up concentrically and are connected to the triple string flow tube. This entire assembly is run into the well on the long string to seal off the bores of the respective packers. The intermediate and short strings are made up with their respective tubing seal nipples and are run in sequence to seat and seal off in the proper sealing bores of the parallel head of the flow tube. *Baker Oil Tools, Inc.*

Hydraulic Set Retrievable Packers

307 Brown Oil Tools is offering a line of hydraulic set retrievable packers available in standard casing sizes for single, dual, triple, and quadruple string completions. This packer makes it possible to run any number of single-string or multiple-string packers on the number 1 tubing string. All other tubing strings are then run and landed, and the well head installed with the completion fluid in all strings and the annulus. With the well under positive control, well fluid is changed over as desired and all zones washed in. The packers can then be set simultaneously, or set and tested individually. No wireline manipulation is required in the setting procedure.

There is no tubing movement while the packers are set. Tubing strings are landed in tension assuring free running of wireline equipment. The packer is released by right hand rotation of the tubing. *Brown Oil Tools, Inc.*

High Pressure Tubing

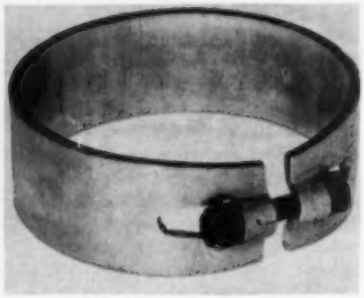
308 Grayloc tubing, a specialty oil country product capable of withstanding the conditions found in the highest pressure wells, is being made by Jones & Laughlin Steel Corporation. The tubing features a high-pressure seal which has previously been used extensively for connections on well-head equipment.

The leakproof seal is achieved by means of an independent seal ring which is so designed that when the tubing joint is made up, the stored energy in the stressed seal ring provides the primary sealing force that holds pressure. Under operating conditions, the internal fluid pressure acts to increase the seal's effectiveness. *Jones & Laughlin Steel Corporation.*

Compact Xmas Tree Has Built-In Valves

309 The latest development from Oil Center Tool Company is the "Unitree," a compact wellhead unit for single or multiple completions which offers considerable savings in weight and height. The unit features "built-in" valves which eliminate numerous joints and flanges, reducing the size of the unit and minimizing possibilities of leakage. Valves are inserted into the body of the unitized tree and can be replaced in the field.

The first tree displayed by the company is only 43 in. high, but is designed to do the job of conventional tree 12 or 13 ft high. It is presently available in series up to 30,000-psi test. *Oil Center Tool Company.*



Holding Devices Eliminate Casing Welds

310 Improved stop collars and newly introduced friction-lock clamps eliminate the need for welding on casing to secure scratchers and centralizers for cementing purposes. Field tests made on "average" oilfield welding for scratchers and centralizers have shown a great variation in weld quality, and damage from undercutting, hard spots, and electrolytic corrosion. Stop collars are secured by driving the slip loops down flush with an ordinary hammer and are equally effective when casing movement is reversed. The friction-lock clamp is installed with a power impact or rachet wrench.

Stop collars and clamps eliminate the need for welding on casing in control of reciprocating scratcher placement and travel, attaching scratchers to the casing, positive placement of casing centralizers on the casing joint, and in locking the guide or float shoe on the casing. *B and W, Inc.*

Casing Head for Medium Pressures

311 The latest addition to Larkin Packer Company's wellhead equipment is the casing head for medium depths and pressures. With a working pressure of 1000 psi, this casing head provides a safe means of suspending and packing-off casing strings. Full opening head facilitates the running of casing with centralizers and makes the head easier to drill through. Direct flanging can be accomplished by means of the tapered API male thread atop the head.

Hardened steel slips are hinged in 3 segments for handling and setting convenience. A link is provided to tighten slips on casing or to hold them together. The head will support 225,000 lb, which is equivalent to 7500 ft of 5½-in., 15-lb casing with a two to one safety factor. *Larkin Packer Company.*

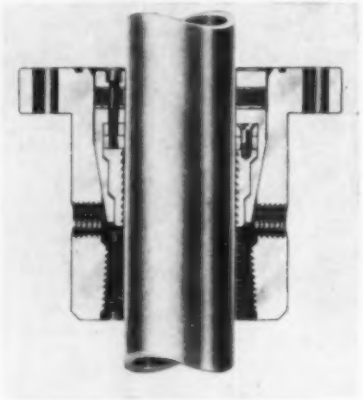
Automatic Casing Hanger

312 The C-8 casing hanger announced by Alco Products, Inc. is of the wrap-around type and is designed both to support the casing and to effect a pressure seal utilizing the casing weight. The hanger is basically of 2-piece construction. Removing one bolt at each side of the hanger at each joint allows the hanger to be opened. The hanger consists of 6 segments of bowl section with a slip segment to each bowl segment. Contoured steps on the external surface of the bowl segments act as load-carrying surfaces which prevent excessive reduction of the casing.

High strength bolts extend from the top packing plate to the slip segments. The load on each slip segment is carried to the top plate and forces the pack-off element into contact with the casinghead body and the casing, effecting a pressure seal. Loads beyond those required to set the packer are carried to the bowl segments which, in turn, are supported by the casing-head body. *Alco Products, Inc.*

Forged Steel Casing Heads

313 This newest addition to the Gulfco line of well heads offers a complete selection of casing suspension. By loosening 1 socket head pack-off cap screw, the assembly can be opened, wrapped around the casing,



and secured. The assembly can then be lowered through a full-opening blowout preventer to its seat in the casing head body. A positive seal of the annulus is effected when the casing load is transferred to the slips. After removal of blowout preventer equipment, the socket head pack-off cap screws can be further tightened manually. *Gulf Coast Machine & Supply Company.*

Offshore Equipment

Rubber Hose for Offshore Flares

314 Waste gas from offshore wells can be carried off by flexible, rubber-covered hose made by United States Rubber Company in 50-ft lengths. It has a special, high-tensile cord carcass for strength, and is covered with corrosion-resistant neoprene rubber. The rubber covers metal connecting joint to protect them from salt water. A light work boat is used to install the flare line. Hose is joined and coiled on deck, then trailed overboard. It settles to the bottom in a natural drape from the oil rig to the flare buoy. The entire job takes about 4 hr. The rubber-steel construction enables the hose to take considerable stress. Gulf storms that have parted the steel cables anchoring the flare buoys have yet to break flare hoses used on offshore wells. *United States Rubber Company.*

Potable Water from Sea Water

315 A lightweight, aluminum, gasoline-driven, vapor compression still, with a distillate capacity of 125 gal per hr, has been engineered and fabricated by Badger Manufacturing Company. The primary use of the easily transportable unit is production of pure drinking water from sea water and brackish water.

Vapor compression stills, of aluminum or cupro-nickel construction, range in capacity from 50 gal per hr to 600 of chemically-pure distillate, meeting USP requirements. They handle sea water as well as other types of raw water and are used also in evaporation operations requiring the concentration of organic and mineral solutions. They are available with a choice of electric, steam turbine, gasoline or diesel engine drives and require a minimum of cooling and condenser water. *Badger Manufacturing Company.*

Drilling Mud Transfer Pump

316 Bulk delivery of drilling mud at transfer rates more than double that of sack delivery can be made with a new semi-portable system manufactured by Fuller Company. Consisting of a pump, skid-mounted with its driving element, the unit may be set into a barge or boat or onshore as needed. Driving element may be an electric motor, gasoline or diesel en-

gine. With the addition of conveying lines, it is possible to transfer up to 100 tons of barite and gel in bulk an hour.

Mounted over the pump is a large hopper which will accommodate 2 standard 50-sack bulk mud cans. The pump unit can be set on a flat deck barge used for making deliveries to swamp rigs or offshore platforms. As one can is being emptied, a loaded can is set on the hopper and the emptied one then removed. In this manner, preweighted quantities of barite are delivered. *Fuller Company.*

Single Stage Cargo Pumps

317 Ingersoll-Rand's single stage cargo pumps are offered in a capacity range of 2500 to 7000 gal per min. The pumps are dual-volute, horizontally-split units with double-suction impellers balanced both mechanically and hydraulically. Bearing housings are water cooled to assure low bearing temperatures when handling hot liquids. Cored suction passages, designed for smooth flow of liquid to the impeller, contribute to high-speed cargo discharge. All assembled parts including impeller, shaft sleeves, stuffing box bushings, bearing nuts, shaft sleeve nuts and flingers are positively locked to prevent loosening. *Ingersoll-Rand.*

Giant Offshore Spudding Shoe

318 A special 30-in. guide shoe for spudding in offshore locations with big savings in time has been developed by Rector Well Equipment

Company. The shoe, butt-welded to a 220-ft string of casing and operated from a crane barge, uses the jetting action of water forced through holes in the aluminum nose to speed up drilling the conductor string hole through the silt that covers the floor of the Gulf of Mexico. Sand and silt packing back around the casing eliminates the necessity of cementing the string. *Rector Well Equipment Company.*

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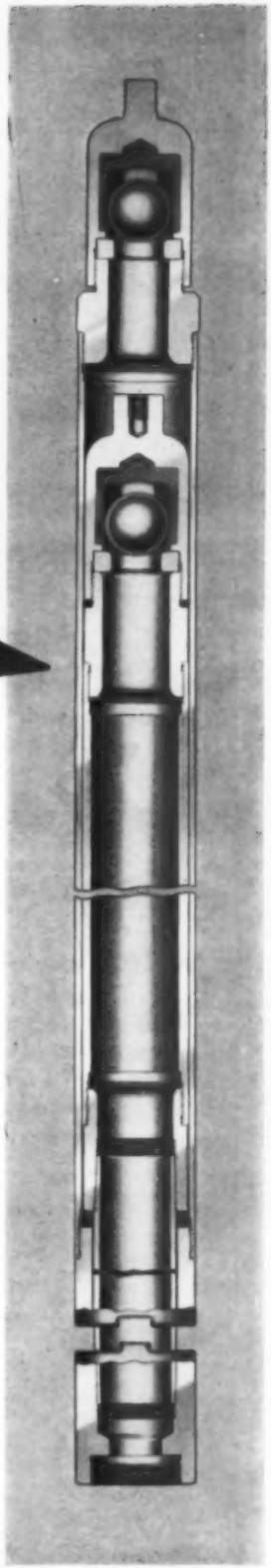

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3 A pump that will seat in a regular production casing packer and may be operated in 5" casing (or larger) thereby eliminating tubing.

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DW-18

Phillips Rig 27 looks down on 584 joints of 7- and 7⅝-in. casing racked in foreground. When run to 22,919 ft, 572 joints weighing nearly 800,000 lb in air were needed in the No. 1-EE University record well of Pecos County, Texas.

What it took to run and cement the . . .

World's Longest Casing String -to 22,919 Ft

Phillips Petroleum Company's No. 1-EE University well in West Texas recently set a world's depth record. Two new honors were added when casing was run and cemented to total depth without incident

World's record cementing operations are carefully planned by (left to right): Don Miller, area manager and Ed Trapp, sales manager for Halliburton; H. W. Patterson, Phillips drilling superintendent; R. A. McKnight, Phillips district superintendent; C. L. Fulton, Halliburton assistant division manager; and Roual H. Dunn, Phillips acting division superintendent.

At 6:20 p.m. on June 11, 1958, the cement plug hit bottom to wind up cementing the world's longest casing string to a total depth of 22,919 ft. This was the second world's record for Phillips Petroleum Company's No. 1-EE University, located some 13 miles east of Fort Stockton in Pecos County, Texas. The first top honor earned by the company in this ultra-deep well was the world's deepest well ever drilled. The former record holder was Richardson and Bass' No. 1 Louisiana Land & Exploration, about 60 miles south of New Orleans in Plaquemines Parish, Louisiana. Phillips passed the old mark of 22,570 ft on May 26 of this year. The new record holder was spudded in on October 12, 1956.

When the casing cementing job was finished, another record was established: the longest cement column . . . from 4100 ft to 22,919 ft for a total of 18,819 ft of continuous cement section . . . performed in a single stage.

This phenomenal operation took 29½ hours to run 12,642 ft of 7-in. (bottom section) and 10,277 ft of 7⅝-in. casing (top section), plus 3 hrs to condition mud, nearly 2 to mix cement and 1 hr and 40 min to displace the cement.

There were two major obstacles: a whipstocked hole at 19,966 ft that reached a maximum deviation of 9 degrees from the vertical; and about 12,000 ft of open hole. A caliper survey showed the hole to be in good shape with a diameter of about 9 in. It was drilled with 8½-in. bits. The mud, which was an important factor in the excellent hole condition, weighed 10.2 lb per gal with a funnel viscosity of 48-52 sec and a water loss of 5 cc per 30 sec. The low solids, water-base, Driscose emulsion mud system contained about 8 percent diesel oil. Graphite was added to minimize torque and drag.

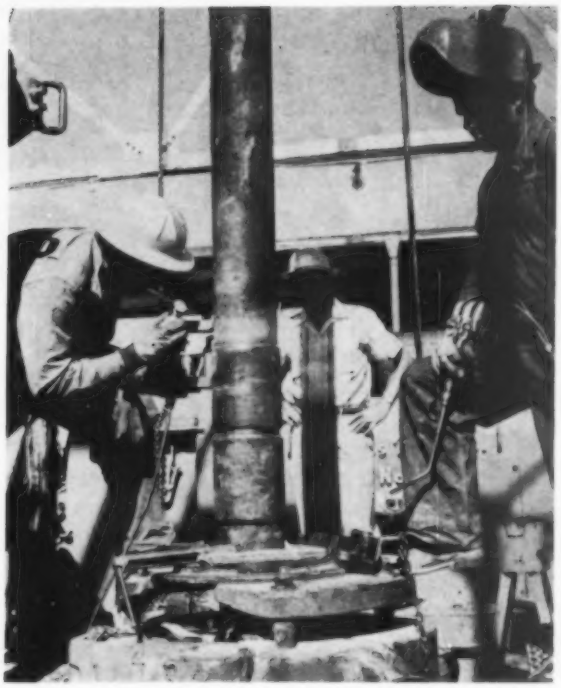
The entire job . . . running casing and cementing . . . went off without a hitch or much fanfare. Phillips technical and operating groups collaborated on every detail. Careful planning and coordination between operator and service groups played a paramount role in this highly successful operation.

The Down-Hole Picture

A continuous velocity log was run prior to running the long combination string. Bottom-hole temperature was approximately 315 F. Phillips' company rig 27 drilled the well. The casing program up to this writing includes:

Depth Interval	Casing Size, O. D.
Surface—1,480 ft	20-in
Surface—6,020 ft	13-3/8-in
Surface—10,966 ft	9-⅝-in
Surface—22,919 ft	7-⅝ (top) and 7-in

At 8:45 a.m., June 10, 1958, casing running operations got underway as the casing fill shoe goes through the casing spider.



Magnetic inspection of all welding on bottom joints of 7-in. casing to fill collars was part of the carefully planned job.

Breakdown on Combination String

Of prime consideration in selecting the combination 7⅝ and 7-in. casing string was to provide desired annular clearance for improved hydraulics when drilling below 22,919 ft with a tapered drill string. The lower section of this "intermediate" string consisted of 314 joints (12,642 ft) of 7-in. OD high tensile P-110 casing. A "crossover" tool connected the lower 7-in. string to the 7⅝-in. string at 10,277 ft. From this point to the surface, 258 joints of the larger pipe were run.

Details of Combination String
(Top to Bottom)

Casing Size, OD., in.	Length, ft.	Grade	Weight, lb/ft.	Type Connection
7⅝	1615	P-110	39.0	Extremeline
7⅝	1516	P-110	33.9	Extremeline
7⅝	7146	P-110	29.7	Extremeline
	(10,277)			
7	2785	P-110	26.0	Buttress Thread
7	3482	P-110	29.0	Buttress Thread
7	2485	P-110	32.0	Triple Seal
7	2635	P-110	35.0	L T & C
7	438	S-95	38.0	S T & C
7	817	P-110	38.0	L T & C
	(12,642)			

Floating Equipment

Eighty-one percent automatic casing fillup as well as mud circulation down the casing when desired was provided by one fill shoe and three fill collars. These are welded to the string in the bottom four joints. The fill shoe, welded on bottom, measured 4½ ft long. In addition to a perforated bullet shaped aluminum screening nose, walls of the fill shoe contained cementing ports. A flapper valve in the shoe was fitted with a 5/16-in. orifice to permit the automatic casing fillup during running operations.

A fill collar with a ⅜-in. orifice in the flapper valve was welded between the bottom and second joint of casing. Another fill collar equipped for tripping the flapper valve with a 1½-in. ball was welded between the second and third joint of 7-in. casing. Between the third and fourth joint of pipe, a third fill collar was welded in place. It was equipped for tripping with a 2-in. ball.

Welding Bottom Four Joints

By locating the floating equipment as indicated above, the bottom four joints of 7-in. casing were joined together. Low hydrogen alloy rods were used and the casing was preheated to about 400 F prior to welding the first bead. The joint was then heated again and cleaned before finishing the weld. It was then allowed to cool in air and then magnafluxed. Other critical equipment was also carefully inspected in this manner for potential failures. Welding was supervised by Phillips metallurgists and welding specialists. Centralizers and scratchers were not used on the combination string.

The Cement System

A total of 5183 cu ft of cement slurry was displaced in this record single stage job. Slurry density was 10.8 lb per gal and tailed in with a 16.0 lb per gal mixture. Here's what the total cement system contained:

1147 sacks of slow setting cement
42,127 lb (40 percent by weight) of Diacel D
1617 lb (1.5 percent by weight) of Diacel LWL, a low water loss and retarder additive

The tail-in slurry for the lower portion of the casing and around the shoe consisted of:

100 sacks of slow setting, high temperature cement
141 lb (0.5 percent) of Diacel LWL.

An excess of 10 percent cement was run over the calculated volume. A total of 760 bbl of water was used in the mixing process.

Cementing Equipment

The cement was pumped into the well by four trailor-mounted pumping units. Each unit contained two high-pressure, heavy-duty cementing pumps. Bulk cement was contained in four 1200 cu ft field storage bins and one bulk cement truck. Mud storage was provided by two 500-bbl and one 250-bbl tanks. Four 250-bbl tanks were used for mixing.

Running the Casing

After the four bottom joints were welded together with the floating equipment and inspected, running operations

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in Extreme Corrosion

RELIANCE
For Heavy Loads
in Severe Corrosion

TYPE 5
For Heavy Duty
in Moderate Corrosion

HEATREAT #1 CM
For Medium
to Heavy Duty
Where Corrosion
is No Problem

A rod for every well condition

If your purchasing system calls for "high tensile" rods from companies A, B and C rather than specifying exact rod grades, your rod strings are costing too much.

For example, Continental-Emsco medium-priced Type 5 rod can handle the same loads of many so called "high-tensile," higher-priced rods. Why? Because, Type 5 contains VANADIUM . . the amazing element that strengthens the rod, so it has greater load-carrying capacities than rods of similar properties *without* vanadium.

Call your C-E man. Talk over your rod requirements . . well conditions. His recommendations will reduce your pumping costs by (1) matching well conditions with the *right* rod, and (2) by giving you *higher quality* for longer service.

D+B API SUCKER ROD COUPLINGS

Strengthen this vital link

All Continental-Emsco sucker rod couplings are *lubrized* to protect coupling threads against corrosion and damage during make-up. These couplings are induction hardened for longer life and *100% inspected* before shipment . . to assure proper field make-up and your complete satisfaction.

for Service

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ODS

Specify..

CONTINENTAL-EMSCO D+B SUBSURFACE PUMPS

Assembled just for your well

The profit squeeze is on. No longer can you afford the luxury of *standard* pump assemblies.. often with metals of poor corrosion resistance, weak intermediate parts, or misapplication of pump materials.

Now, you need to take advantage of the full range of Continental-Emsco subsurface pumps ..37 types with over 700 variations. There's one to pump every well, efficiently and economically, regardless of depth, type of hole or corrosive, abrasive or gaseous conditions. Talk over your pump requirements with your C-E man.

Be sure to take advantage of C-E subsurface pump repair shops.. located in producing fields everywhere.

e that Sings..

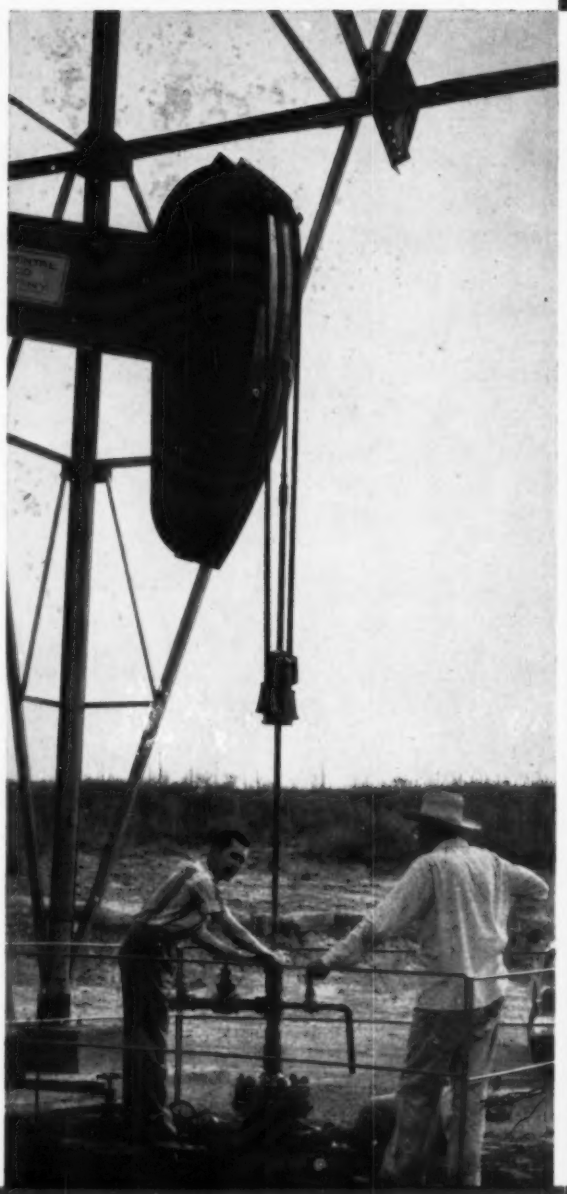
Specify THE ECONOMY PRODUCTION TEAM

..CONTINENTAL-EMSCO UNIT PUMPERS and SPECIALISTS

Your Continental-Emsco man sees that you get the *right* unit pumper for the job. He sees that it is *properly applied* with the right stroke length for maximum pump efficiency . . with the right strokes per minute to reduce rod failures and prevent excessive wearing of gears, belts and bearings.

Changing well conditions are easily met by C-E safe, ground-level counterbalancing . . economically done by one man. Here again, you can count on your C-E man. He weighs your wells, when necessary, to be sure you are getting maximum lifting efficiency at the lowest possible fuel or electrical cost.

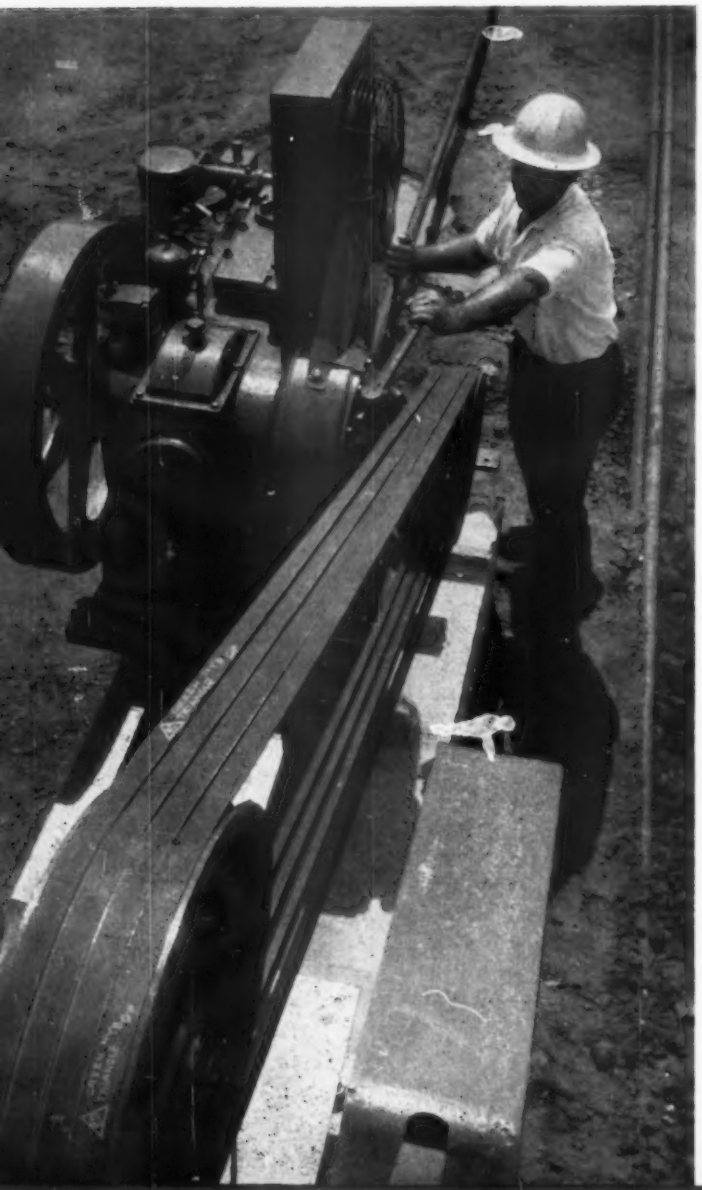
For service before, during and after installation, specify Continental-Emsco unit pumpers . .



..Equipmen

Proper Attention Guarantees Longer Life for

GREEN TRIANGLE V-BELTS

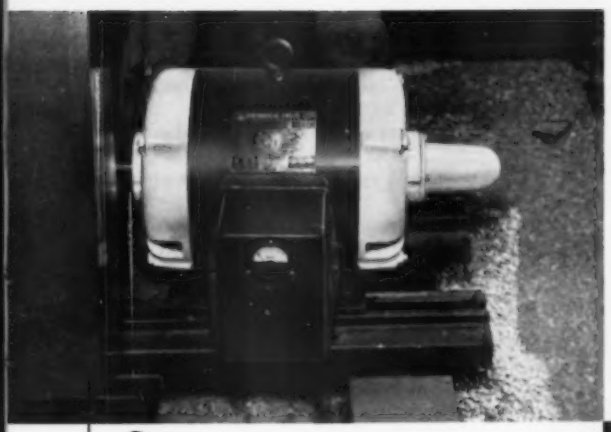


Recommendations of your C-E service man on tension, alignment and operating conditions will greatly increase belt life. His advice as to the number of belts to use assures maximum power transmission and often cuts initial costs.

Proper belt adjustment is easy with GREEN TRIANGLE V-BELTS . . sold in *matched sets*. Since each belt is identical in diameter, length, thickness, material and freshness with others in the set, adjustment for one assures uniform adjustment for all.

New York Belting and Packing Company packs Green Triangle V-belts in matched sets . . *a performance plus feature* that costs no more . . exclusively at Continental-Emsco stores.

t that Hums



Specify..
BIG ITEMS . . or small

Each Continental-Emsco store is individually stocked to meet the requirements of localized fields, so regardless of your lease location, you'll find all the items needed to do a better pumping job. Specialists are readily available to advise you on well-maintenance problems . . how to keep your production costs in line.

Specify..
C-E GREEN TRIANGLE ELECTRIC MOTORS . .
they're replacing many higher rated motors

After taking a close look, many major companies are standardizing on C-E GREEN TRIANGLE ELECTRIC PUMPING MOTORS. Here's why. They have a 40° C. rise and a *guaranteed 1.15 service factor* to handle unanticipated power demands. Their 5-8% slip and 275% starting torque reduce peak electrical loads. An exclusive *built-in* balance meter cuts well maintenance costs by making it easy to balance your wells . . see that they stay in balance. Rods and unit pumper are not vibrated apart as when pumping with an unbalanced well load.

This motor fits your pumping needs . . will cut your production costs. It's *oil field* tough . . *oil field* proven . . with Continental-Emsco *dependability* built-in.

Learn to rely upon your C-E stores for lower-cost production . . and

for equipment that hums . . service that sings.

CONTINENTAL-EMSCO

Serving the Oil and Gas Industries ... Worldwide

P82

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Representatives in All Principal Oil Fields of the World

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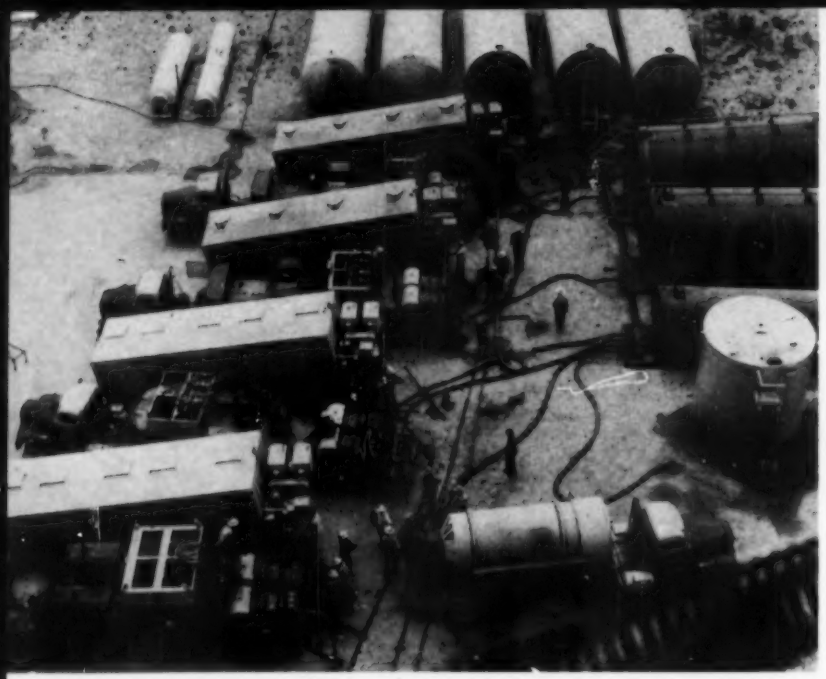


Cementing equipment assembled for record job included four pump trucks; four field bulk cement storage trailers, a bulk cement truck, mud, water and mixing tanks.

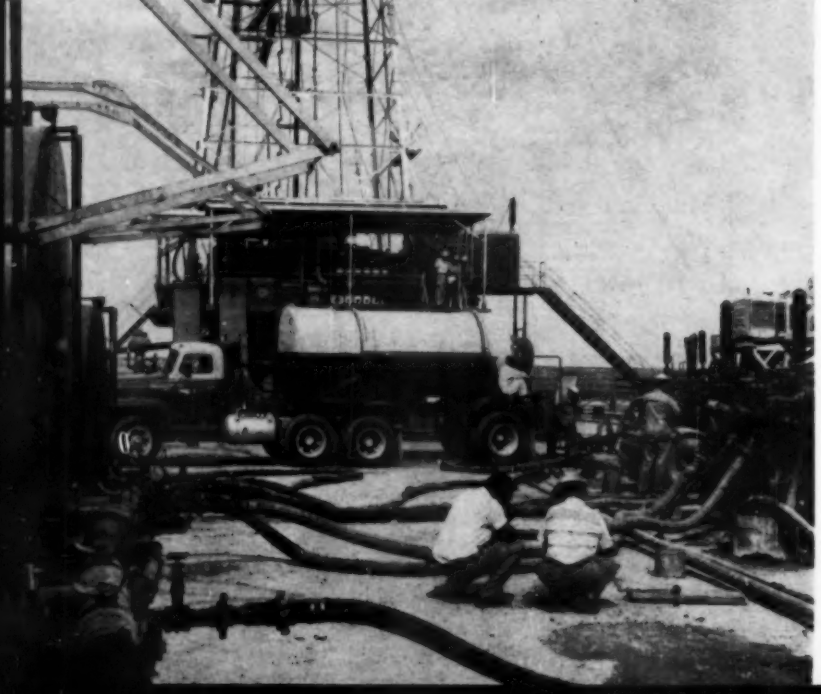
got underway at 8:45 a.m. on June 10, 1958. The pipe was lowered in at the rate of about 20 seconds per joint, not including connection time. An API high-pressure thread dope was used on the screwed connections above the bottom welded joints.

When the bottom of the 7-in. string was about 200 ft above the 9⅝-in. string set at 10,966 ft, the pipe was halted and mud circulated down the 7-in. and back up inside the 9⅝-in. casing. Mud was circulated for 1 hr and 10 min before running casing was resumed. At this point, the weight indicator showed a weight of 320,000 lb. Circulating pressure was 800 psi.

After running in 12,742 ft of 7-in. pipe, the 7⅝-in. casing was added to the string by means of a "cross-over" connection. To minimize the "ram" effect of the casing, lowering time per joint was increased to 45 seconds. After running 12 joints of 7⅝-in. casing, mud began returning to the surface. An additional 374 joints of 7⅝-in. casing was run before and return was lost. However, gain in weight of the string indicated it was filling automatically. After 20 more joints without returns, mud return was re-established.

The casing was 50 ft off bottom at about 11:00 a.m. June 11. The last two joints were circulated to bottom by 2:15 p.m. Total weight of the combination string in air was about 700,000 lb; maximum weight shown on weight indicator was 570,000 lb.

Displacing the cement with mud took one hour, 43 min. At left are three mud storage tanks connected to pump trucks at right.



Cementing Operations

The four cementing units alternated as two teams. Cement mixing started at 2:43 p.m. on June 11. It was planned not to exceed 2000 psi during the cementing operation. Minimum pumping rate was set at 6 bbl per min. As cementing commenced, pump pressure was 1800 psi but quickly settled to 1500 psi.

At 4:37 p.m., one hour and 54 min from the start of the job, all cement had been mixed and pumped into the casing. A 7⅝-in., 5-wiper top cementing plug was released from the single plug container head. No bottom plug or measuring line was used.

The cement was displaced with mud pumped by the cementing units until the plug was bumped at 6:20 p.m. Total displacement time was one hour and 43 min.

Displacement rate varied from 6 bbl per min to 14 bbl per min, with an average rate of 9.2 bbl per min. Total displacement was 951 bbl. Displacement pressure ranged from 900 psi to 1900 psi, but remained at about 1600 psi during most of the job.

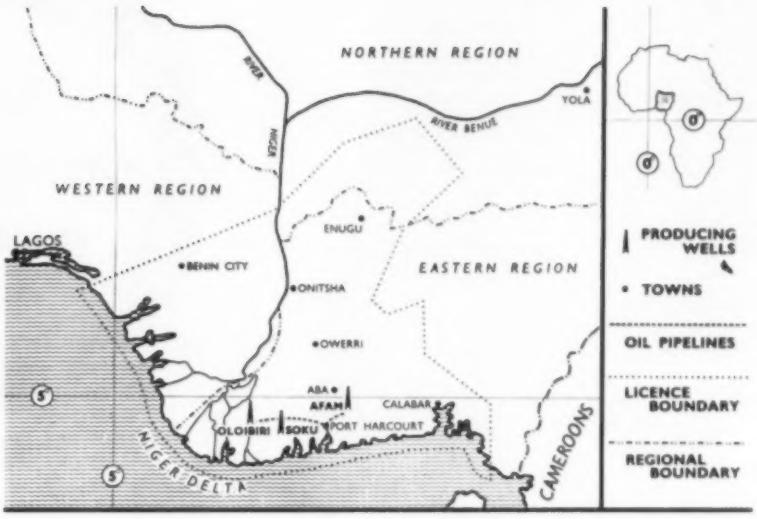
Three hours and 37 min were required for mixing, pumping and displacing. Pumpability time was estimated at 5 hr and 4 min. A total of 5183 cu ft of cement slurry was displaced during the job.

A temperature survey following cementing indicated the top of the cement to be at a depth of about 4100 ft. Due to careful preplanning of cement formulation, cementing techniques and job performance, the cement was run in a single stage.

Phillips has announced that the test may go as deep as 25,000 ft to reach its objective . . . base of the Ellenberger. Drilling has resumed with a 5¾-in. bit.

Acknowledgment

Material for this brief report came from several sources, but special acknowledgment goes to Halliburton Oil Well Cementing Company, Duncan, Oklahoma, and to Rector Well Equipment Company, Incorporated, Fort Worth, Texas. Permission by Phillips Petroleum Company, Bartlesville, Oklahoma, to publish this report is gratefully acknowledged. ★ ★ ★



Nigerian oil search has been long, slow and expensive. Fruits of the exploratory efforts are only now becoming visible. The pipelines from Oloibiri and Afam to Port Harcourt are easing one of the biggest problems — transportation. — *Map Courtesy of Shell-BP*

New Oil in Nigeria

- **Shell-BP finds third oil productive area at Soku, in mud swamps of Niger Delta**
- **Sarawak Oilfields Ltd. turns back 75 percent of leases, keeps coastal region acreage**

A NEW OIL FIND has been made in Eastern Nigeria — in the swamp and mud of the Niger Delta at Soku, about 30 miles west of Port Harcourt.

This is the third oil-bearing region discovered by Shell-BP. Their extensive search has extended over 40,000 sq miles of Nigeria where, and to date, more than $80,000,000 has been spent in the past four years.

The two other oil-bearing areas are at Oloibiri, also in the Niger Delta and 45 miles due west of Port Harcourt, and at Afam, in the back country, but only 20 miles northeast of the city.

The well at Soku was drilled to a depth of 10,000 ft. Because of the swamp site, an artificial island was constructed.

Because of the high cost of island-building, a drilling barge has been constructed at a cost of £4,000,000 and was expected to commence work early in July. Drilling teams will be accommodated in eight house boats.

Oil Production

Recently the first cargo of oil from Nigeria arrived in the U.K.

Oil from the Afam field is already being piped through a 6-in. line to Port Harcourt (see map), at the rate of about 2500 bbl a day. Production at the Oloibiri oil field is at present limited to some 600 bbl per day until the 10-in. pipeline from Oloibiri to Port Harcourt is completed.

Production from Oloibiri is then expected to increase to 3500 bbl a day giving the total area an output of about 6000 bbl a day.

Lease Surrender

Almost in the same breath Sarawak Oilfields Ltd., a member of the Royal Dutch/Shell group, announced that they will relinquish 36,650 sq miles of oil leases, mainly in the interior of Sarawak, at the end of this year as both post and pre-war surveys have produced no evidence of oil deposits.

Since World War II, this company has spent nearly $27,000,000 drilling a total of 17 deep exploratory wells.

With the exception of those at Suai near the coast all were dry. At Suai insignificant traces of gas and oil were located.

Although, in fact, about 77 percent of the leased land in the area is being surrendered, the obligation of the lease requires only 11,875 sq miles to be surrendered by the end of 1958 and similar areas in 1963 and 1968. Sarawak Oilfields will retain 10,850 sq miles, mainly in the coastal areas where the search will continue.

Between 1954 and 1956 the corporation participated in a co-ordinated survey of the offshore areas of Sarawak, Brunei and North Borneo. Results of this marine survey have been sufficiently promising to warrant drilling at several locations in Sarawak waters.

Two wells have been drilled by Sarawak Oilfields from a marine platform at Ampa Patches, about 25 miles offshore. Although dry, further exploratory drilling at sea is planned. ★ ★ ★

GETTING
CORRECT RING FIT
IS EASY WITH
.... Martin Plungers and the Martin Method of Installation*
The rubber-and-duck rings swell just so much and no more.
Rings reach maximum size in the well within a few hours.
Dimensional Compensation during the manufacturing process assures the uniform working fit obtained with Martin Split Rings.
The Martin Ring Size Guide Table* assures proper ring size selection for various gravities, temperatures and sand and water content.
Martin Split Rings are made in steps of .005" in diameter, so that you can actually increase or decrease plunger clearance that amount by changing to next larger or smaller size.

The gaps between the Martin Rings cause fluid turbulence which slows down slippage past the Martin Plunger — just as a rough road slows down your driving speed. Actually, the Martin Plunger maintains pumping efficiency with a looser fit than is possible with a smooth surface plunger.

* See the complete Martin Catalog and instructions in the 1957 Composite Catalog.

JOHN N. MARTIN

Manufacturer

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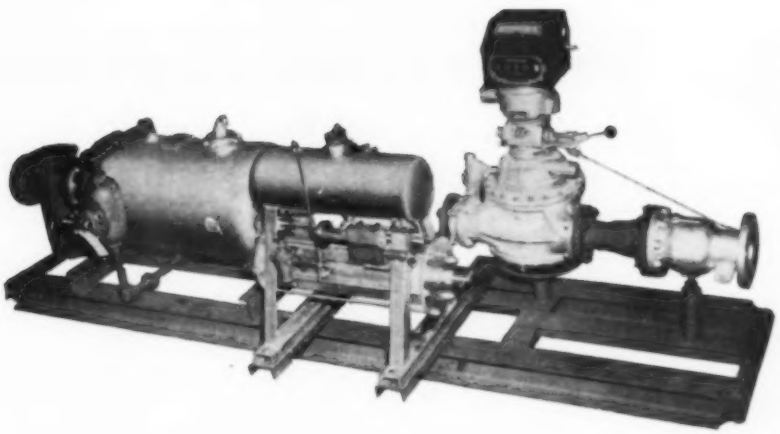
The Latest In . . .

Production Equipment

An authoritative report by equipment manufacturers on their latest, most important new developments for oil and gas production



Crude Meter and Sampler

319 Maintenance Engineering Corporation has announced an automatic crude oil metering assembly with proportional sampler. The skid-mounted unit automatically shuts down after allowable has been flowed, with volume corrected to 60 F and registered on counter and/or ticket. The sampler stores sample at line pressure. Air and non-condensible gases are automatically separated from liquid and vented. Metering of gases is prevented. The unit includes line-size strainer, line-size deaerator, float-operated pilot and safety shut-down valve, proportional sampler, positive displacement liquid meter, and set stop valve. *Maintenance Engineering Corporation.*

Forged Steel Gate Valves

320 Manning, Maxwell & Moore announce a new line of forged steel gate valves including both inside and outside screw and yoke designs with standard and full flow ports. Valves are offered with a wide range of alternate trim and body-bonnet materials. Sizes range from ¼ in. through 2 in.

In screwed, socket weld, and flanged ends depending upon type, these valves are for all pressures up to 600 psi at 910 F, 800 psi at 860 F, and 2000 psi at 100 F. They employ such design features as stainless steel spiral wound gasket, extra heavy body and bonnet flanges, and stainless steel wedge. *Manning, Maxwell & Moore, Inc.*

Pressure-Operated Valve

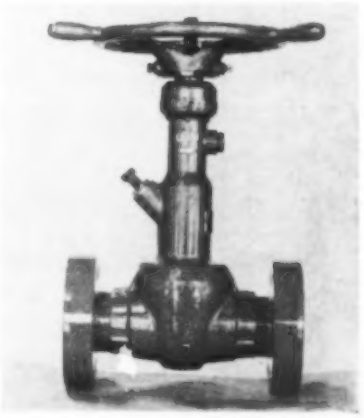
321 The Mission Manufacturing Company's pressure-operated valve answers the need for a valve specifically geared for pneumatic or hydraulic operation and incorporates the power controls within the valve itself. The valve incorporates a split piston that is moved from one end of the cylinder to the other by gas pressure. The pilot valve which controls the flow of air or gas may be located at the wellhead or any convenient central location.

The unit can be furnished as a full or regular opening, through-conduit valve, 1000 to 5000 psi, WOG, with threaded or flanged end connections and is available in either through-conduit or 3-way models. The through-conduit valve is a simple off-on valve that can be used as a wing valve or master valve for Christmas trees or for gathering lines. The 3-way valve is designed principally for manifolds where tank switching or individual well testing is desirable. In operation, this valve switches a single inlet to either of two outlets. A differential of 10 percent operating pressure is required with a minimum of 20 psi. *Mission Manufacturing Company.*

Forged Steel ASA Class Valve

322 New features and upgrading of materials make the new Orbit forged steel ASA class valve equal to a stainless trimmed valve in quality. All working parts that are exposed to fluid flow are made entirely of or are trimmed with stainless steel. Stems are made of heat treated stainless steel. Only one lubrication point is provided. It lubricates only the guide pin and handwheel assembly, and is isolated from the lower mechanism of the valve.

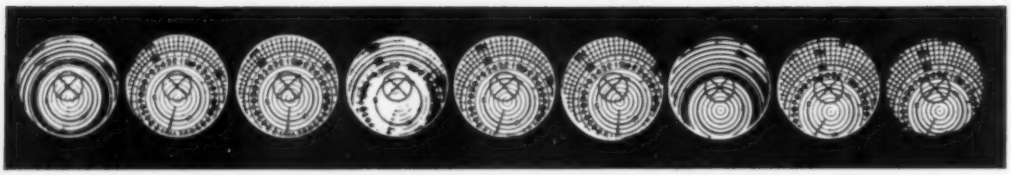
The forged steel body and bonnet and welded construction are combined to give the valve a compact design and reduced weight, to allow installation in a minimum of space. *Orbit Valve Company.*



MAGNETIC MULTISHOT DIRECTIONAL SURVEYING

FAST,

SPECIALIZED SERVICE BY SPERRY-SUN EXPERTS



You get a complete directional-inclinational survey of the uncased bore of your well with one trip by the Sperry-Sun Magnetic Multishot Survey, even at temperatures where other surveys fail.

Records are made automatically and continuously at 20 second intervals on either the in-run or out-run. The instrument, operated by a Sperry-Sun technical crew, can be run on wire line, in open hole or dropped through the drill pipe to a non-magnetic drill collar or through a core bit.

Your survey is read and calculated at the rig, and preliminary information is available at that time. Final calculations and a horizontal projection of the survey are furnished the customer upon completion.

All Sperry-Sun offices are equipped to run Magnetic Multishot Directional Surveys—call the one nearest you for prompt service in accurate mapping of your well.

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B and W

Scratchers and Centralizers for a Good Cement Job

Pioneers in the Improvement of Primary Cementing

In the drilling of oil wells, mud cakes are formed on the permeable formations. Cement slurry will bond with the formations only when the mud cakes have been "scratched off" the wall of the hole.

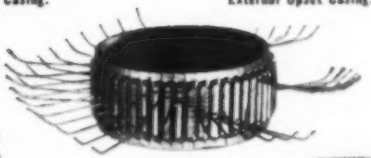
B and W originated and pioneered LATCH-ON CENTRALIZERS for easy installation . . . the KON-KAVE Bow for greater centering strength . . . the WALL CLEANING GUIDE . . . the MULTI-FLEX and HINGED NU-COIL SCRATCHERS FOR POSITIVE MUD REMOVAL AND COMPLETE CEMENT FILL.

The combination of (1) B and W Scratchers, (2) B and W Centralizers, and (3) Movement of the Casing as the cement slurry is placed—is

YOUR BEST INSURANCE FOR A GOOD CEMENT JOB

B and W Solid Automatic Stop Collar Eliminates Welding on Casing.

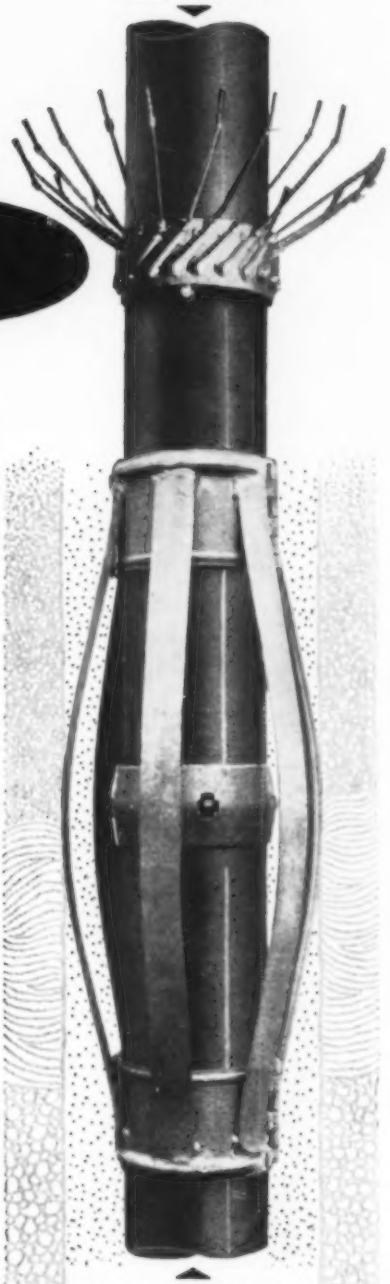
B and W Hinged Automatic Stop Collar for Usage on External Upset Casing.



B and W Rotating Scratcher—Multi-Flex Type. Sturdiest for Cementing Casing and Open Hole Plugs.

B and W Wall Cleaning Guide. The Original Scratcher.

B and W Hinged-Nu-Coil Scratcher. Most Economical — Easiest to Install.



B and W Multi-Flex Scratcher. Easiest on the Hole.

B and W Combination Unit. No Welding—Maximum Scratcher Travel.

B and W Latch-On Centralizer. Strongest Kon-Kave Bows.

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WEST COAST — 19706 S. Normandie Ave., Torrance, California, Phone FAculty 1-2463

Stainless Steel Flow Control Valve

323 Merla Tool Corporation has introduced its Type A flow control valve used for controlling the flow rate of gas or liquids. Each working part, except the cast steel body, is manufactured from stainless steel to protect against rust and corrosion.

A straight line increase of flow is controlled by a plug-type, proportioning, hardened valve. The stainless steel,

self-centering, "O" ring sealed seat eliminates eccentricity and is easily replaced. The Teflon sleeve packing gland provides a positive, bubble tight seal requiring no lubrication. A calibrated handle offers micrometer adjustment in tenths of turns with complete turns calibrated on an indicator. Available with 1-in. through, 1-in. angle, 2-in. through, or 2-in. angle body. *Merla Tool Corporation.*

Three-Way Control Valve

324 Hammel-Dahl announces the development of one basic valve design adaptable to both flow blending and flow splitting. For stability of control in handling maximum allowable pressure drops, 3-way valves must have the direction of flow tending to unseat the plugs. Formerly, this was achieved with different valve bodies for the 2 types of control. This new valve permits conversion of one construction to the other by changing the plug and lower seat ring. The valve body (including the screwed-in, replaceable, upper seat ring), and the bonnet, valve cage, and plug stem are identical for both valves. The lower seat ring has no threads, but is retained by the valve cage for ease of disassembly and replacement. *Hammel-Dahl, division of General Controls Company.*

Constant Tubing Pressure Choke

325 Gulfco's new constant tubing-pressure automatic choke controls a well automatically within the limits of the minimum and maximum positive chokes. A tee or an ell in the flow line is removed and replaced with the choke cross and a tubing pressure line is connected to the choke control head. Operator then adjusts the spring tension to the desired tubing pressure he wishes to maintain on his well. The automatic choke does not require 2 wings on the tree. None of the essential parts of the tree are removed.

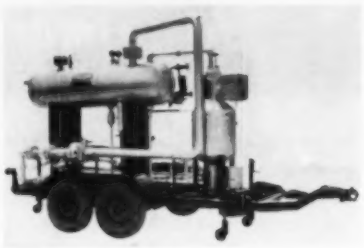
To decrease the amount of fluid being produced, the operator would lessen the spring tension, which allows the well to flow on or near the minimum choke until the tubing pressure declines to the set spring tension. When spring tension is greater than tubing pressure, flow increases in proportion to tubing pressure decline. The choke can be adjusted to produce the allowable without shutting in the well. *Gulf Coast Machine & Supply Company.*

Flow Indicator Has Adjustable Range

326 A simple, reliable indicator shows at a glance whether flow is taking place. Clearly visible from a distance, a chromium-plated ring spinning under a toughened glass dome has definite movement which precludes chance of misreading. Variable flow models can be reset in the field for high or low range and are available with die-cast brass body in ½ in., ¾ in. and 1 in. pipe sizes for flows from 0.72 to 24 gal per min. Other models are available for flows from .075 to 120 gal per min in pipe sizes up to 3 in. *McIntosh Equipment Corporation, Walker Crosweller Division.*

Trailer Mounted Well Tester

327 Oil Metering and Processing Equipment Corporation has developed a new high-pressure well tester which has a 2000 psi working pressure. The horizontal 3-phase well tester separator vessel has a 24-in. OD by 7-ft seam-to-seam shell. It utilizes a meter with 1 bbl dump volume capacity and 2000 psi working pressure; a 1-in. 5 pointer water meter; 4-in. AGA gas



run with orifice meter. The unit is also equipped with a shrinkage tester for measuring volume flash reduction.

In operation, well fluid first passes into the separator. A separating element at the inlet removes the gas, passing it through a mist extractor into the gas run where it is measured by the orifice meter. Free water settles to the bottom of the separator and is discharged and metered separately. Distillate passes into the meter where it is metered in 1 bbl dumps. Rated metering capacity of the unit is 720 bbl per day. *Oil Metering and Processing Equipment Corporation.*

High Volume Metering Separators

328 Rolo Manufacturing Company has introduced a new line of high capacity metering separators. Called Hi-Cap metering separators, these combination separating-oil metering units have parallel dump type metering chambers built in the separator vessel. A 3-way inlet valve diverts incoming oil production to the meters, alternately filling one meter while the other discharges. Capacities up to 50,000 bbl per day are available, and viscous crudes are easily handled since there is no dependence on gravity flow through piping and valves.

Units are available with either volumetric metering or weight metering (for high gas content crudes), the latter with precision floatless dump controls. *Rolo Manufacturing Company.*

Want some more information?

Mark Reader Service Card for further data direct from the manufacturer.

MY CREWS DO A FASTER JOB with GUIBERSON SWABS

There's no substitute for a fast-falling, smooth-pulling Guiberson swab in speeding-up swabbing operations. Crews make fewer trips .. do a better clean-out job .. lift more fluid per hour. So naturally they're in and out quicker .. at the *lowest possible* swabbing cost. Match one of these cups to your swabbing job.

TYPE J .. lifts heaviest loads

TYPE L .. lifts medium or light loads

TYPE GW .. for light loads

TYPE K .. general purpose cup to 6,000 feet

SIMPLEX .. lifts fluid containing suspended sand

More than a third of a century of swab-making experience is behind each Guiberson swab and cup. No matter what type of production .. shallow or deep .. light or heavy loads .. smooth, rough or tight tubing .. you will pull more fluid with Guiberson swabs and cups. Regardless of your swabbing problem, you can meet it .. solve it .. quicker and cheaper with a Guiberson swab.

Cups are compounded to Guiberson's exclusive formulas for maximum resistance to oil .. acid .. abrasion.

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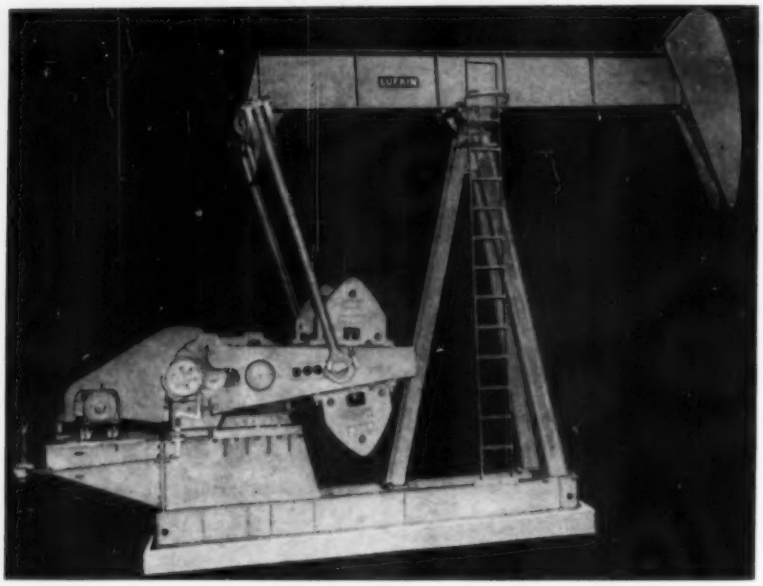


Pumping Units Feature Improved Base

329 Lufkin Foundry and Machine Company announces that their line of pumping units is available with an improved version of their Hi-Prime base. This base was originated 30 years ago for use with the worm gear reducers incorporated in Lufkin units of that period. With the improved base, the motor is mounted to the rear of the gear box, minimizing fire hazard. Also, motor is high enough to prevent damage from flood waters, blowing snow, or blowing sand. Unit base is 30 percent shorter and is lighter in weight than conventional units.

If the operator requires a gas engine installation temporarily, the proper unit base extension can be furnished, and the electric motor extension can be bought when the lease is electrified. *Lufkin Foundry and Machine Company.*

Hydraulic Pumping Units

332 An increased range of sizes of Johnston hydraulic pumping units extends hydraulic pumping to the shallowest wells. Units are available for wells from 350 to 9000 ft deep. Totally enclosed system eliminates contamination of the hydraulic fluid. Spacing of the bottom-hole pump is accomplished by the turn of a valve which varies the point of bottom reversal anywhere from 10 to 20 in. As a result of softer cushioning at top and bottom reversals, standard copper tubing and fittings are used on the cylinder for high-pressure conduits. *Engineered Oil Tools, Inc.*

Beam-Balanced Shallow Well Unit

333 For shallow wells, Alten Foundry and Machine Works, Inc., offers 4 new D-6 beam-balanced pumping units to cover a wide range of applications. The units utilize forged steel helical gearing in the reducer which has a torque rating of 6400 in.-lb. Maximum stroke lengths of 18 in. and 24 in. are available on both 2000-lb and 3000-lb structures. Large sleeve bearings are used at the center saddle and tail bearings and double-row spherical, self-aligning roller bearings are used at the wrist pin connection. *Alten Foundry and Machine Works, Inc.*

Retrievable Anchor Protects Tubing

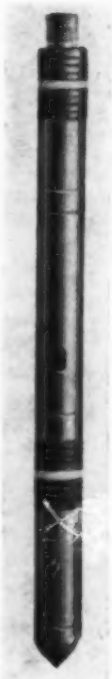
330 American Iron & Machine Works has introduced a short, compact tubing anchor designed for use in wells of any depth. In pumping wells the buckling, breathing, and corkscrewing of tubing can be prevented by keeping pumping strings in tension with the anchor. Standard models allow a tensile pull at the anchor ranging from 0 through 35,000 lb. When more pull is exerted at the anchor, the safety shear groove will be sheared and the anchor automatically released.

The anchor may be used as positive tension tubing anchor, or automatic tension tubing anchor. The anchor uses a conventional "J" type setting mechanism and is completely retrievable under all conditions. *American Iron & Machine Works Company, Inc.*

Oilwell Pumping Starter and Timer

331 One device replaces two on the new General Electric oil well pumping starter. The combination timer performs the functions of a separate program time and sequence timer. Program timing of the pumping cycle is controlled by toggle tabs. The full set of tabs programs the pumping over a 24-hr period, and in intervals as short as 15 min. Automatic sequence restart after power failure is also controlled by the time, preventing overloading of power supply caused by several motors restarting at the same time.

A kit for adding a skip-a-day feature is available, and can be added in the field with only a screwdriver. Timer operation over a wider temperature range is obtained with a −30 to +130 F grease-lubricated driving motor. *General Electric Company.*

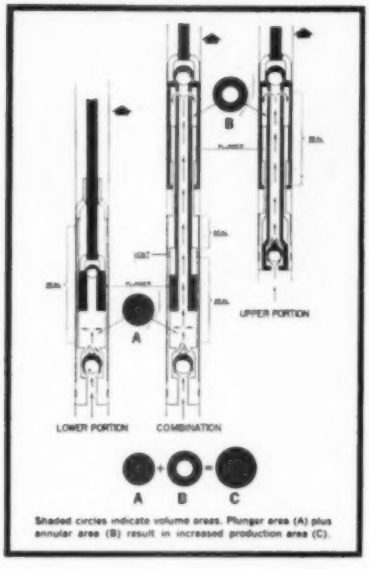


Small-Diameter Gas Lift Valves

334 Two models of junior gas lift valves, for use where limited diameters prohibit employment of standard size valves, have been added to the Harold Brown Company line of oil field production equipment. One model is the "K Series," for KB, KC and KT side pocket mandrels. The other is used in conjunction with standard mandrels. Bellows assemblies are interchangeable between the two. The junior size is a 1-in. valve with a .750-in. OD bellows having an effective area of .300 sq in. Both valves are available with the magnetic ball check valve. *Harold Brown Company.*

High Volume Insert Pump

335 Axelson Manufacturing Company's new Volumax pump for 2-in. tubing features a ⅞-in. liner column using a ⅞-in. plunger to seal and create an upper telescoping annulus, with a resulting production 22 percent more than that obtained with a tubing pump. Lower portion plunger area (A)



Shaded circles indicate volume areas. Plunger area (A) plus annular area (B) result in increased production area (C).

plus upper portion annulus area (B) combine to provide increased volume (C).

Volumax pumps may be operated at a depth limited only by sucker rod stress. Tandem construction provides extreme rigidity of all parts during compression portion of stroke. Since it is an insert pump, tubing need not be pulled. *Axelson Manufacturing Company.*

Tubing Pump Top Seal

336 The Oilmaster automatic top seal is designed for use with a stationary barrel bottom-anchored pump to stabilize the top of the pump and to prevent sand or other foreign material from settling in the annulus between the pump and the tubing string. No special actuation is required to set or release the top seal. When the pump is seated, the weight of the rods seats the seal. The rubber element will remain set until the pump is removed from the well.

Ports are provided in the housing to equalize fluid pressure between the pump and the tubing string, giving hydrostatic support to the outside of the barrel while the pump is operating, and permitting fluid to drain past the top seal when the pump is unseated. *Fluid Packed Pump Company.*

Hydro-Mechanical Tubing Anchor

337 The Guiberson Corporation announces availability of a new type tubing anchor. The anchor is an automatic tension type tubing anchor which maintains the minimum tension required to prevent tubing buckling and breathing. Anchor is run above the pump and automatically engages the casing when the pressure at the anchor reaches approximately 200 psi. The anchor then moves freely down hole, but prevents upward movement, maintaining the lowest level necessary to prevent tubing buckling and breathing. Anchor sets automatically when fluid rises in tubing. No surface manipulation is required to set. The anchor is available for 5½-in. or 7-in. casing with 2-in. or 2½-in. field connections. *The Guiberson Corporation.*

New Pumping Motor Line

338 A new line of a-c motors, especially engineered for oil well pumping duty, has been introduced by Reliance Electric and Engineering Company. Engineered to high torque, medium slip specifications, the 220-440-v, 1200-rpm motors are available in NEMA frames from 5 to 40 hp. The motors are equipped with "Gulf Coast" insulation, and feature lubrication which automatically meters the precise amount of grease to the bearing as needed.

Motor frames are constructed from solid cast iron to give protection from water, oil, chemicals, acids and other corrosive elements. The cast iron conduit box has a special water-tight, gasketed fit with its cast iron cover. A shaft slinger prevents foreign matter from entering the shaft opening on the shaft end of the motor. A corrosion-resistant brass shaft cap on the opposite end of the motor provides total protection against the entry of dirt, dust or moisture along the shaft. *Reliance Electric and Engineering Company.*

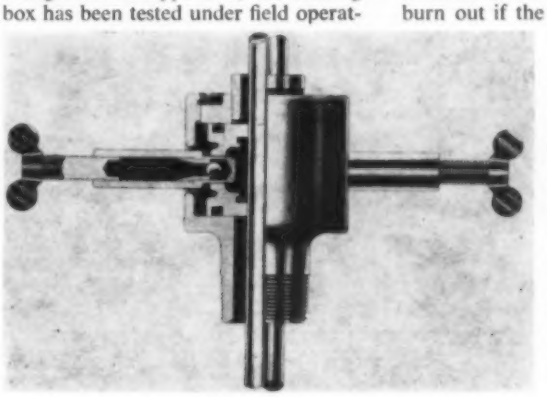
Electric Motor for Oil Well Pumping

340 An electric motor designed specifically for oil well pumping has been developed by Continental-Emsco. The motor features a built-in balance meter. The balance meter is a field working tool and provides a means for obtaining and maintaining efficient pumping operation. The operator can tell at a glance, by watching the action of the balance meter, whether the well is balanced.

Two shaft extensions are included on the electric motor, allowing the motor to drive from either side and rotate in either direction. The second shaft can be used to drive auxiliary equipment such as pumps, chemical feeders and air compressors. A metal cover is provided to protect the shaft not in use. The motors are available in sizes from 3 through 30 hp and have a 275 percent starting torque and a 40 C rise. Slip is 5 to 8 percent for reduction of peak current demands and to lower electrical cost. All motors have a guaranteed 1.15 service factor. *Continental-Emsco Company.*

Polished Rod Stuffing Box

339 A new polished rod stuffing box which assures free lateral movement of the floating gland is available from Kinzbach Tool Company, Inc. Designated as Type 241, the stuffing box has been tested under field operating conditions on many compositions of well fluid.



Lateral movement of the floating gland compensates for any misalignment of the polished rod. It is packed with a plastic packing which is self-lubricated, will not adhere to the rod or burn out if the well pumps off. Additional packing may be inserted into the stuffing box gland through lateral tubes at any time without shutting-in the well. A wear bushing is provided and sized to prevent contact of the polished rod with tubing and fittings and reduces wear and damage to these parts. *Kinzbach Tool Company, Inc.*

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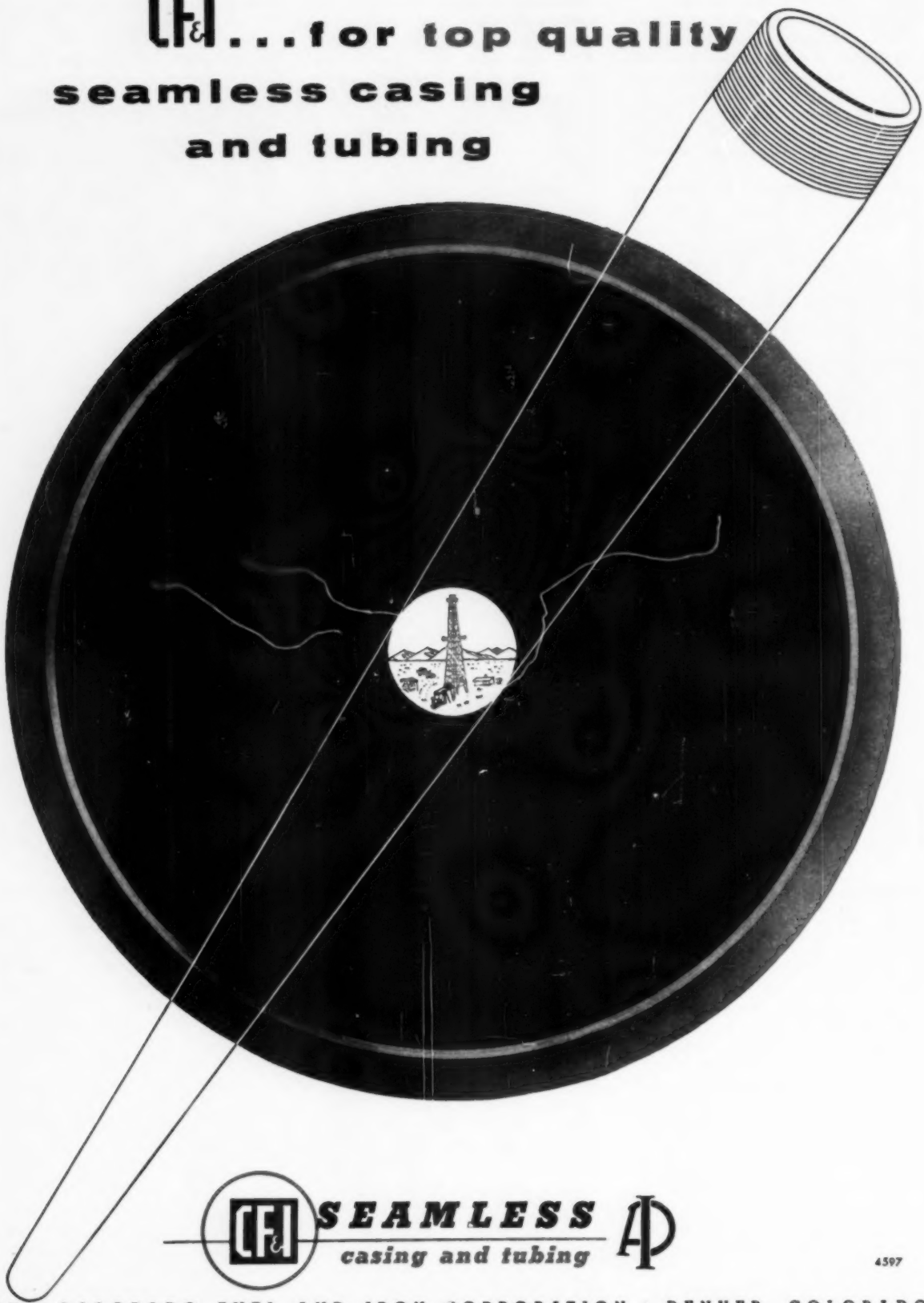

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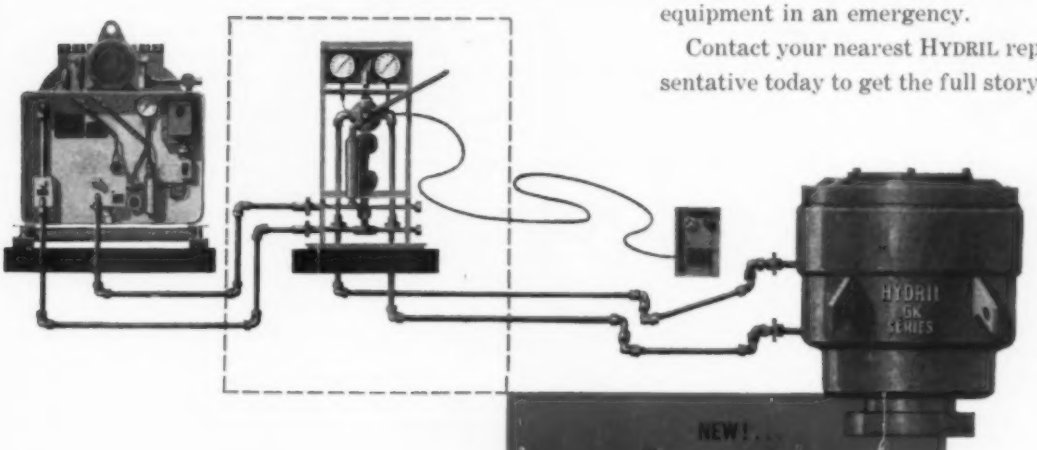

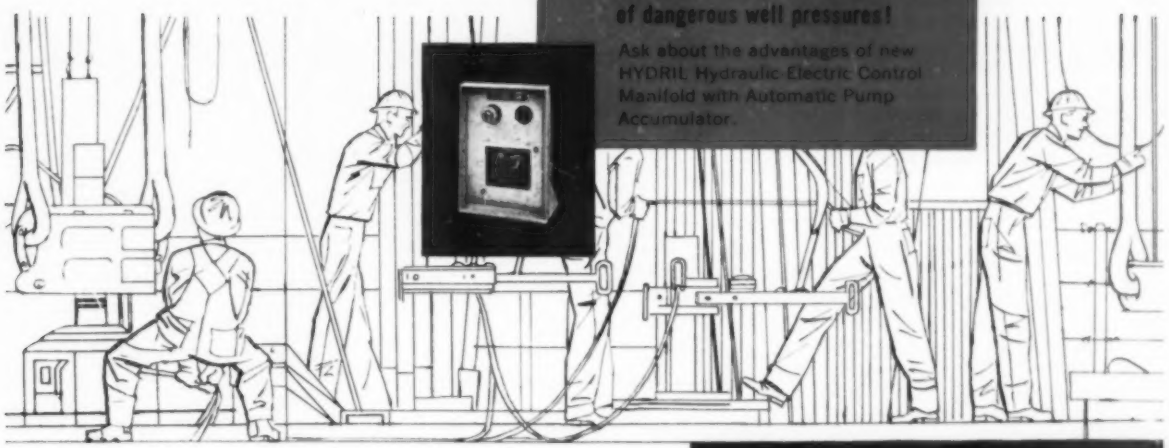
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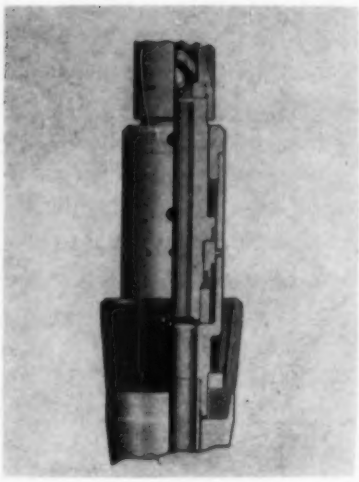


Pumping Well Casing Drain

341 The Oilmaster casing drain is designed for installations using a sub-surface pump equipped with a cup type packer and anchored directly to the casing string without the use of tubing. This installation requires no weight to make the initial seal and therefore does not require a tail pipe.

The casing drain connects the pump to the packer. It functions at the time the pump is pulled. A straight upward movement of the rods will unseat the seal, opening ports in the drain to equalize fluid pressures above and below the packer. The seal is of large diameter to balance out the hydraulic unseating force that occurs on the upstroke of the pump. In addition, a brass friction ring supplies an additional hold-down force. The "O" ring seal is retained in a dovetailed slot, permitting the casing to be drained and refilled repeatedly in service without replacing the ring. *Fluid Packed Pump Company.*

Deep Well Pumping Unit

342 A new heavy duty pumping unit has been designed by Alten Foundry and Machine Works, Inc. The D-320 herringbone type gear units for deep wells have a torque rating of 320,000 in.-lb and are available in both 24,000-lb and 30,000-lb structures having standard maximum stroke lengths of either 74 in. or 84 in. Adjustable cranks with weights which can be locked in place are standard equipment on these units. Units also feature large weather protected automotive type brakes, bronze bushed center saddle bearings and tail equalizer bearings, hinged horseheads, and centrally located ground level lubrication systems. *Alten Foundry and Machine Works, Inc.*

Magnetic Plunger-Lubricator System

343 A new well plunger-lubricator-controller system, featuring a magnetic trip mechanism, has been introduced by the Harold Brown Company. The magnetic tripping device replaces one used previously, which was purely mechanical, and eliminates the need for any openings, protrusions or movable seals into the lubricator.

With the system, a balanced magnetic circuit is interrupted when the plunger enters the lubricator. This triggers a pilot valve which closes the controller, shutting down the flow line motor valve instantly. *Harold Brown Company.*

Double Displacement Subsurface Pump

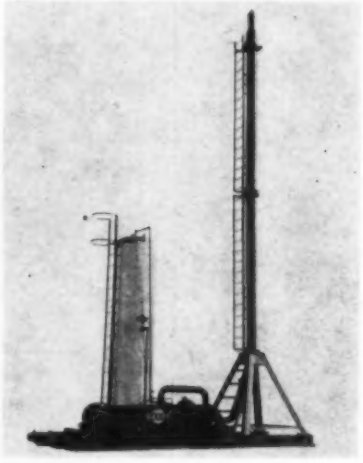
344 Continental-Emsco Company announced a new duplex subsurface pump that provides many improvements in double displacement pumps. The pump is a stationary barrel bottom hold down rod insert pump and because of its design provides a number of important features. The pump was designed to be used where a greater volume of fluid is desired than can be obtained with present equipment and where the same volume of fluid is required to be produced at a slower pumping speed or shorter stroke length to increase life of rod string and pumping unit gear box.

Important features include efficient filling of displacement chamber on the upstroke, decrease in friction, and greater gas handling characteristics. The pump discharges 50 percent fluid on the upstroke and 50 percent on the downstroke, keeping sediment moving up the hole. Existing pumps can be converted to the duplex design with only 3 special parts needed. Operator can choose pump parts to combat sandy, corrosive and other extreme well conditions. *Continental-Emsco Co.*

Long-Stroke Hydraulic Pumping Unit

345 The Cabot H36-27 long-stroke hydraulic pumping unit has a rated capacity of 36,000 lb rod load and can pump six 27-ft strokes per min. Stroke length may be reduced by 1-ft intervals to 23 ft.

The unit features simplicity of operation with only one start-up step, minimum counterbalance variation throughout the stroke cycle, direct-actuated reversing valve, and continuous filtration of oil in the unit. Air compressor and scavange pump may be run independently to charge the system with air or oil without operating the main pump. Front cross members are readily removable for well servicing. *Cabot Shops, Inc.*



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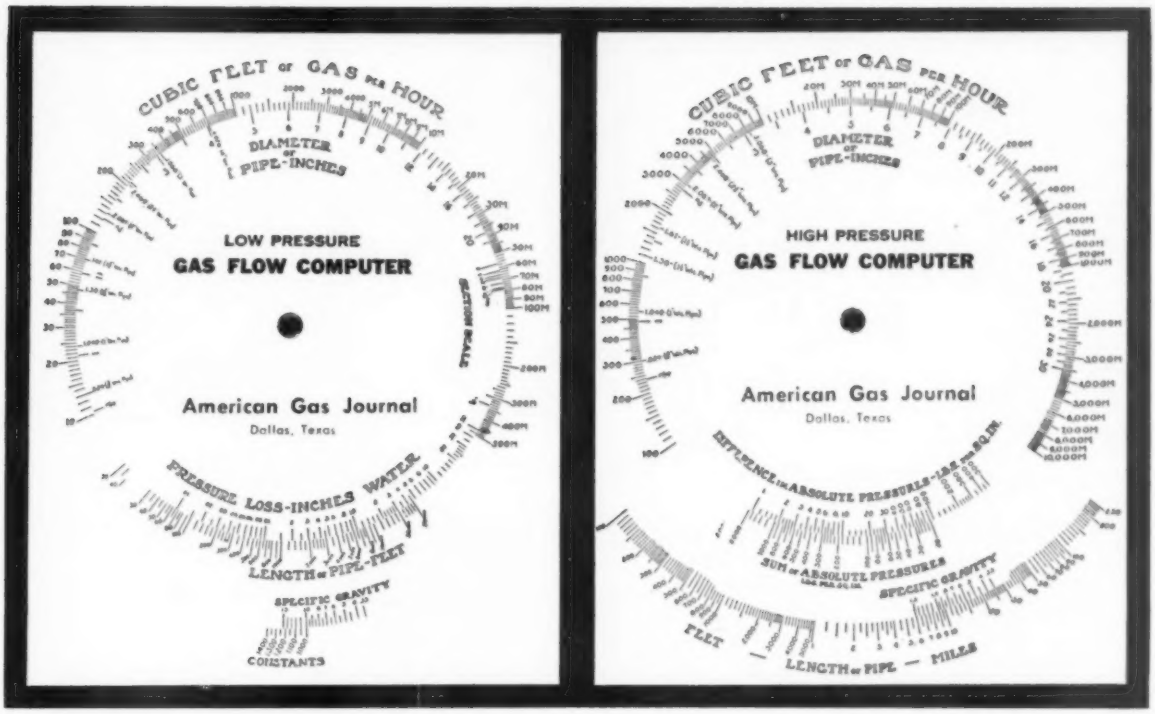
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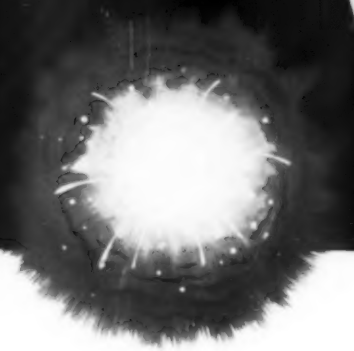

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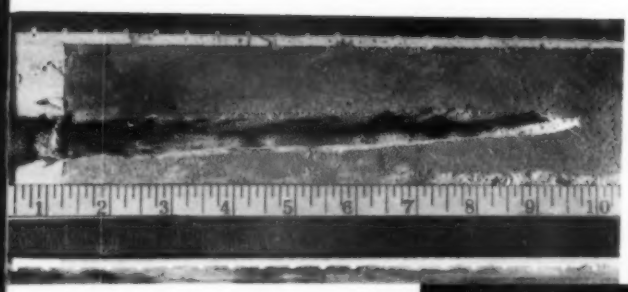

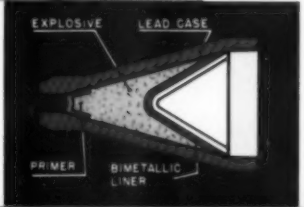

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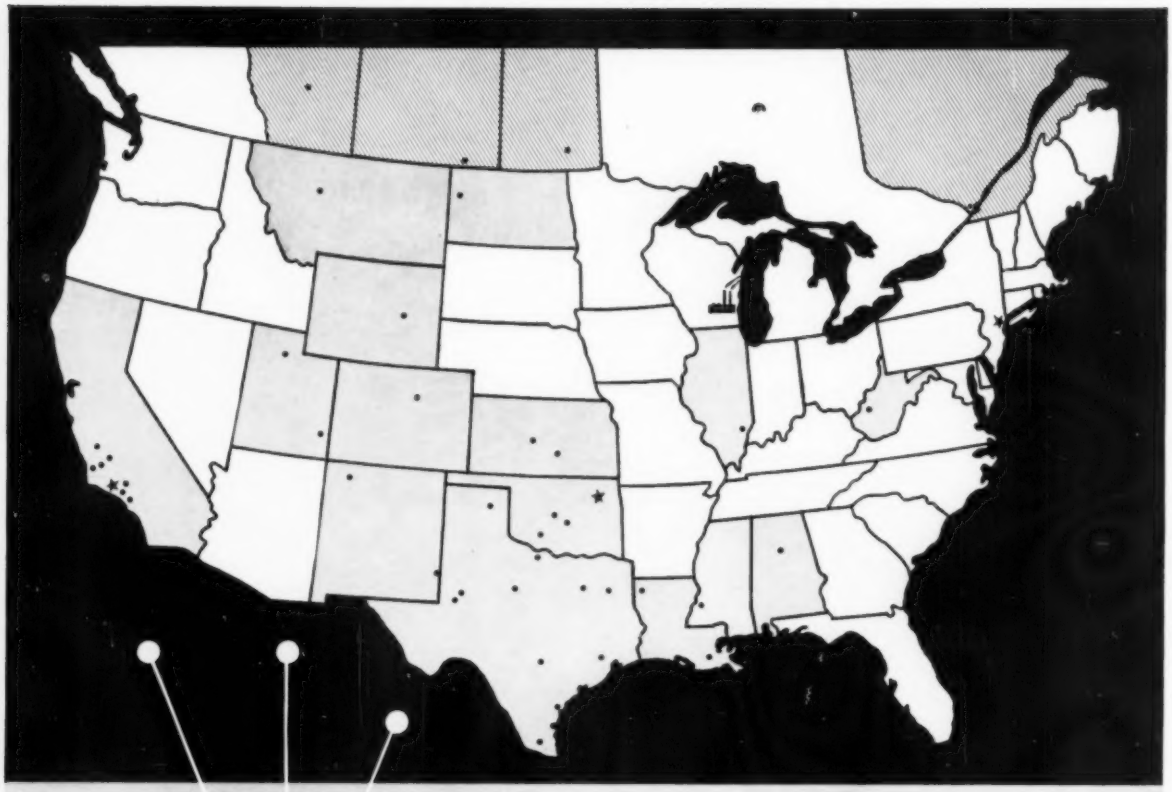

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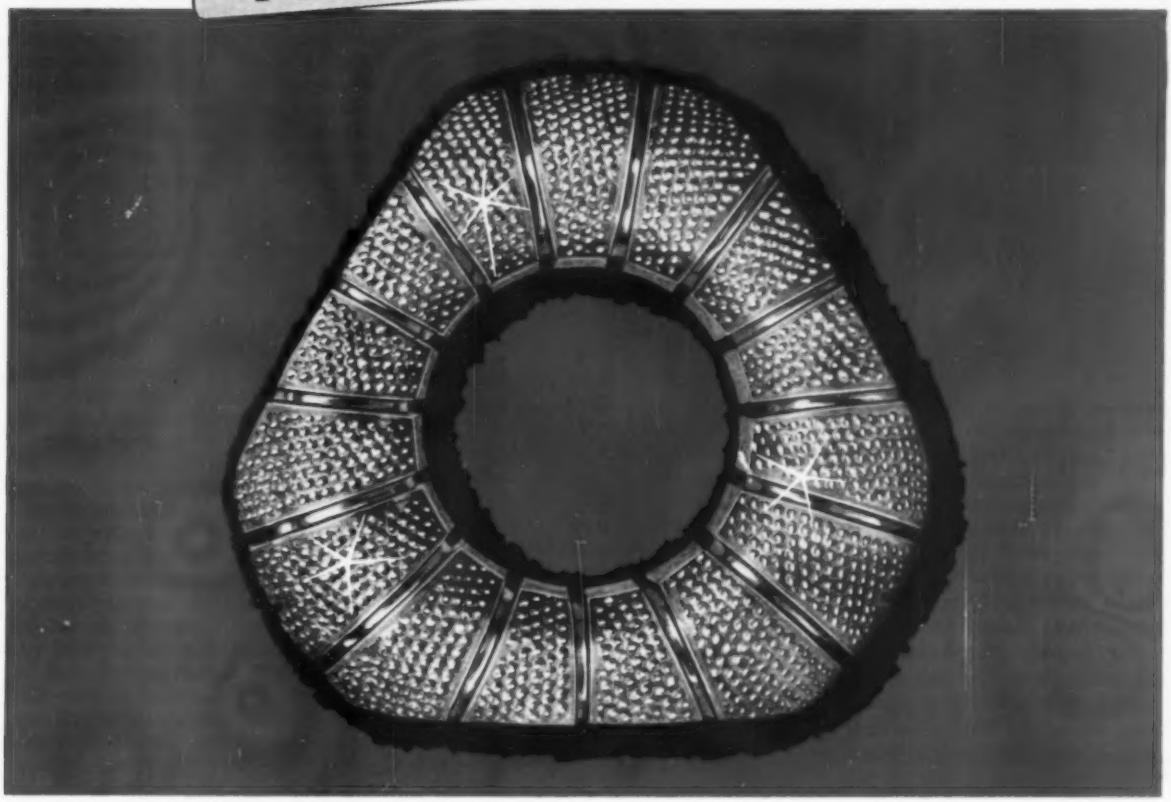

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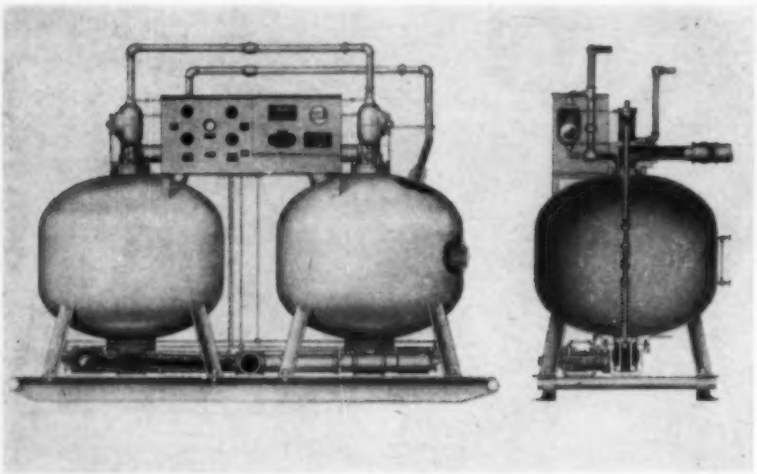

Custody Transfer Meter and Recorder

346 An automatic custody transfer unit manufactured by Garrett Oil Tools measures gross fluid as it is produced and records total volume, corrected to oil at 60 F, on a direct-reading mechanical counter. Two fluid volume meters are synchronized and interlocked to provide practically continuous delivery of metered oil. The interlocking system assures that each vessel is filled before flow is switched to the other, and that neither can receive additional fluid until all fluid from a previous cycle has been discharged and the vessel vented.

High and low liquid level controls are isolated from the main measuring chamber. Through-connected valves at the top and bottom of the chamber isolate the exact volume within the chamber, and it is this volume that is measured at each cycle. After the discharge, fluid entrapped in the high level control drains into the chamber and is measured on the next cycle. The transfer unit is furnished in 2-bbl and 10-bbl sizes, each consisting of two 2-bbl and two 10-bbl meters, respectively. *Garrett Oil Tools, Inc.*

Gas-Oil Ratio Kit

347 Merla gas-oil ratio kits, compactly assembled in a sturdy metal case, contain all equipment required to take gas-oil ratio tests. The equipment consists of a pressure recorder, complete with clock, recorder charts, ink, winding key, orifice capacity tables, 2-in. orifice well tester with 7 orifice plates and 10 ft of ¼-in. hose with snap-on fittings. The kits are available with single or 2 pen recorders in a variety of pressure ranges to cover all standard requirements. *Merla Tool Corporation.*

Unit Controls BS&W Content

348 The Monitron was designed by United Engineers, Inc. to monitor continuously crude oil being delivered to the pipeline. When BS&W exceeds a predetermined acceptable percentage, the unit causes oil to be recycled through the heaters. When BS&W is reduced to the acceptable maximum, the unit again allows oil to be delivered to the pipeline. Time delay circuitry is provided so that excess BS&W must persist for a predetermined time before shut-down occurs, preventing cycling on short slugs of contamination. Shut-down also occurs for gas or air in the probe as well as for instrument failure. *United Engineers, Inc.*

Packaged Unit Operates Lease Automatically

349 Graver Tank & Manufacturing Company has introduced an integrated production system which handles 1000 bbl of oil per day with 20 min weathering time each cycle. The unit performs the following operations automatically: (1) Runs crude oil from the well into the pipeline on a predetermined schedule; (2) Rejects water-contaminated oil back to treating equipment; (3) Measures and records crude oil run to the pipeline; (4) Takes and stores proportional samples of oil and records temperatures, and (5) Shuts down production when lease allowable has been produced or when power failure occurs.

The IPS unit consists of a calibrated meter tank with float chamber, transfer pump, BS&W monitor probe, sampler and valves unitized and piped on skid for portability. The unit includes all necessary electrical wiring and explosion-proof accessories on skid with battery control panel and cable for remote mounting. *Graver Tank & Manufacturing Company, Inc.*

Oil and Water Meter

350 The new "FV" Vol-U-Meter has been developed by Oil Metering and Processing Equipment Corporation. The meter has a reduced diameter neck top and bottom to provide high metering accuracy. The unit has 2 float operated liquid level control pilots, one at the upper dumping level and one at the lower dumping level. When inflowing liquid reaches the upper control level, the pre-set control pilot closes the inlet valve and the outlet valve opens. When liquid reaches the low dump level, the control reverses, closing the discharge valve and opening the inlet valve. Each time the pre-determined unit volume is accumulated, isolated and discharged, one cycle is registered on the counter or recorder.

The meter is available in working pressures of 125, 300, 600, 1200, 1800, and 2400 psi. Dump volume ranges from ¼ bbl to 30 bbl per dump with rated capacities of 300 to 20,000 bbl per day. *Oil Metering and Processing Equipment Corporation.*

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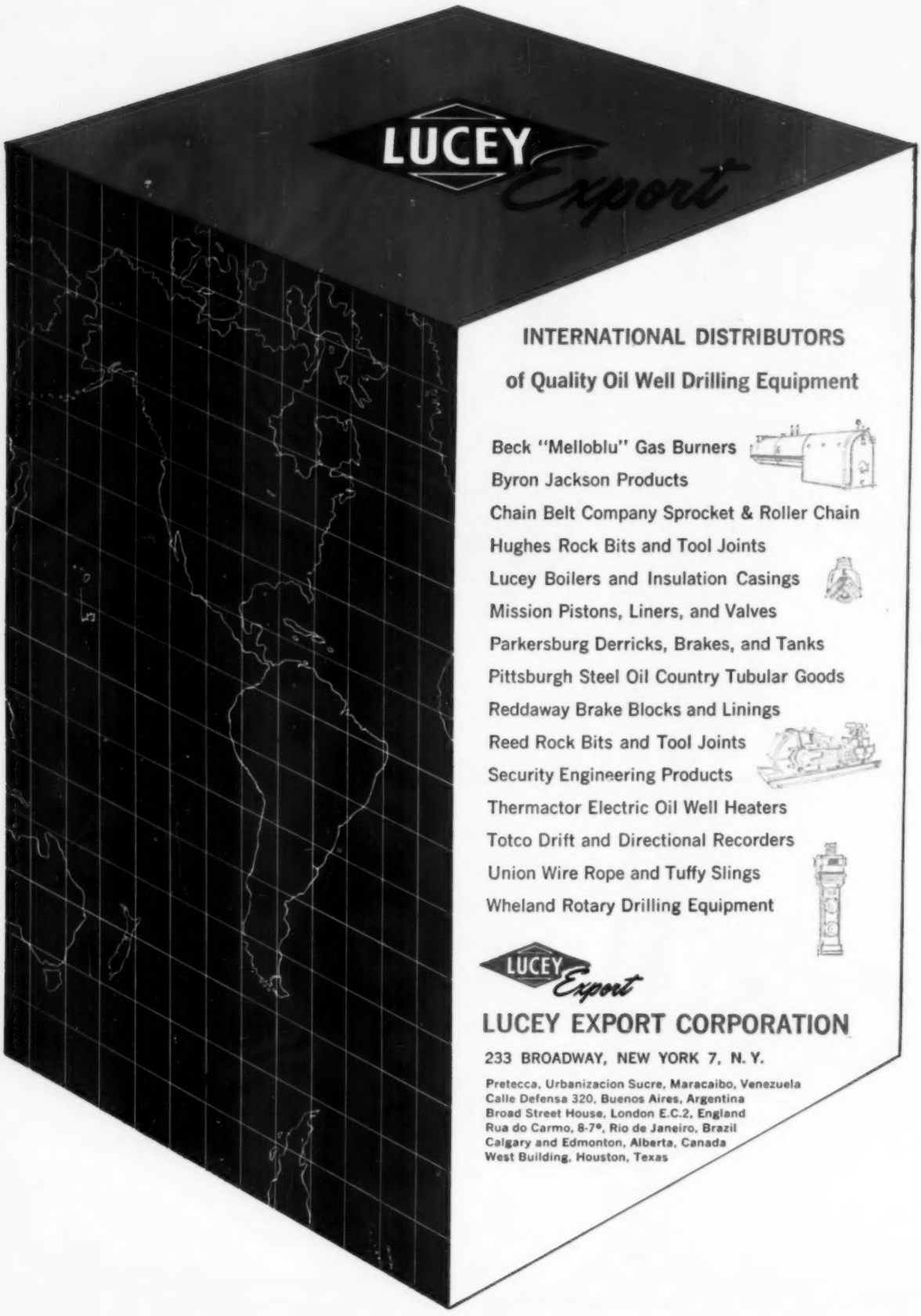
FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD



INTERNATIONAL DISTRIBUTORS

of Quality Oil Well Drilling Equipment

Beck "Melloblu" Gas Burners
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NEW NEW NEW NEW NEW NEW NI

Bit Lube

E. P. ADDITIVE FOR MUD

INCREASES Bit Bearing Life

More than doubles bit life-- reduces costly round trips

Magcobar's Bit Lube (E.P. Additive for Mud) imparts extreme pressure lubricating properties to drilling mud. It provides the drilling industry for the first time with a means of continuously lubricating bit bearings effectively.

Bit Lube (E.P. Additive for Mud) produces a tough oily film which coats the metal at contact points and provides lubricating properties in the presence of mud far better than conventional mud materials. Bit Lube is an easy to use liquid additive for use in selected types of mud.

Extensive research, backed up by field tests, has shown that bit bearing life is increased from 2 to 5 times. The number of round trips is cut accordingly and drilling costs greatly reduced. Wear on drill pipe and pump parts is decreased and rotating torque is substantially reduced.

Where failure of bit bearings forces bits to be pulled before the cutters are worn, Bit Lube offers an opportunity for saving rig time and lowering overall drilling costs.

Let us help you investigate how Bit Lube can be used in your operations. Mail this coupon for technical literature on Magcobar's Bit Lube.

These photos show the results of tests on a standard lubricant tester using a typical drilling mud. Both test blocks were subjected to an initial load of 50,000 psi and run for 10 minutes on the standard tester. The upper block (lubricated with a typical mud) shows the effect of metal to metal contact. The lower block (same mud with Bit Lube added) shows the polished scar obtained with proper lubrication.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION
HOUSTON, TEXAS

99-301

Sales Dept.
Magcobar
P. O. Box 6504, Houston 5, Texas

Please send me your technical literature on Bit Lube.

Name_____

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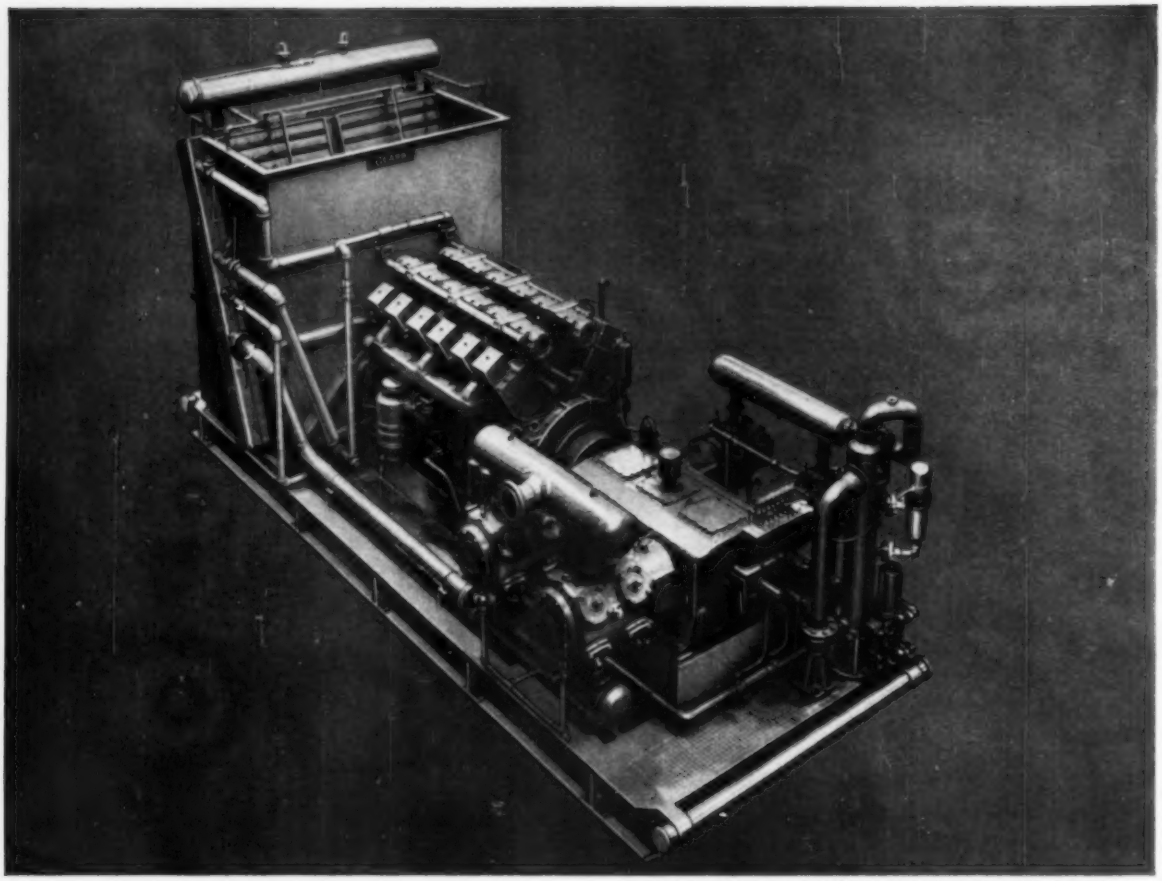
PE



The Clark model CFA-4 is a completely self-contained compressor station. It is built in eight sizes ranging from 200 to 350 bhp.

Clark CFA balanced/opposed compressors are completely packaged for rugged field service

Portable, proved and popular, Clark CFA compressors are specifically built for air drilling, gas lifting, gas gathering, boosting, testing, repressuring, and other exacting oil-field services. These packaged units are available in two and four cylinder models, in sixteen sizes, covering a range of 100 to 350 bhp.

Direct drive assures greater efficiency

In the CFA, Clark engineers have done away with power-robbing, troublesome gears and belts between the engine and the compressor. A simple rubber block coupling takes their place. This direct drive feature is made possible by the perfect balance of the Clark CFA. It explains how the compressor can operate at a modern 1000 rpm. The direct drive design is also responsible for considerable reduction in skid size and in housing costs.

Balanced/opposed design eliminates vibration

Compressor cylinders are mounted on opposite sides of the crankcase and are connected to crankthrows which are 180° apart. With this arrangement, reciprocating masses, which are of equal weight, are always moving in opposite directions. Because there are no unbalanced forces, vibration is practically non-existent and operating costs are cut down and kept to a minimum.

Easier to install, move or shelter

Since the CFA is a self-contained compressor station, installation presents no problem. Just enough concrete to level the unit is all that is required. Clark CFA's are excellent compressors for swamp country, as well as barge and truck mountings. For air drill-

ing, you can even mount the compact CFA on timbers. It won't "walk" away.

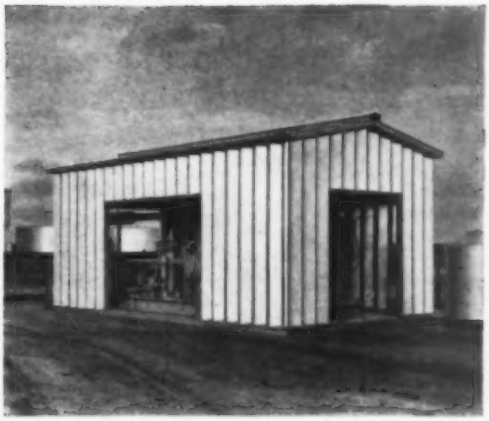
Unitized radiator simplifies cooling

All cooling services are efficiently handled by the unitized radiator built right on the skid . . . and include engine water jacket, compressor cylinder water jacket, lube oil cooling, and as required, inter and after cooling of the gas stream.

CFA contains many "big compressor" features

Into the sturdy Clark CFA have been built many "big compressor" features. These include a steel crankcase, a one-piece forged steel crankshaft, forged steel connecting rods, precision bearings, and forced feed lubrication. You will find that you'll deplete the field, but you won't wear out the Clark CFA.

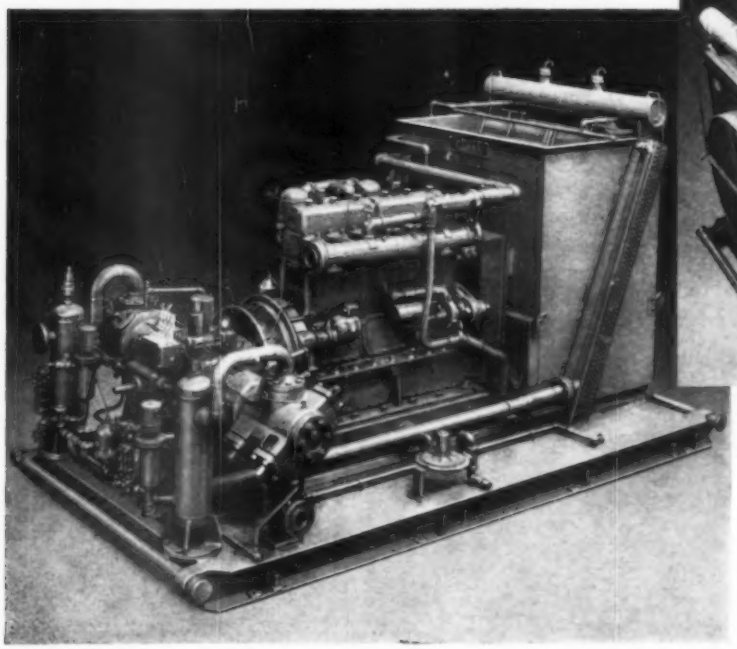
The Clark *encyclopedia of experience* – in design, manufacture, and application is always at your service. For complete data on all CFA balanced/opposed compressors, call your nearby Clark engineer. Or write today for the new Composite Catalog, Bulletin No. 151 to Clark Bros. Co., 1205 Lincoln Avenue, Olean, N. Y. Clark is one of the Dresser Industries and maintains sales and service outlets in principal cities throughout the world.

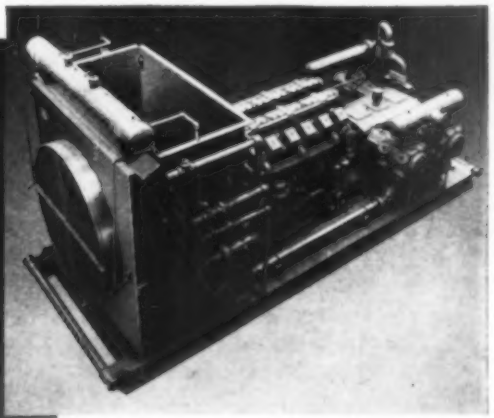


Here a 128 bhp Clark CFA-2 does heavy duty in a field installation for gas gathering. Note the simple installation.

The CFA-2 is also available in electric motor driven units if desired. Illustrated is the 100 bhp model.

Below: **The completely packaged CFA-2 comes in eight sizes ranging from 100 to 200 bhp. No costly field assembly is required.**





The unitized radiator in this CFA-4 handles *all* cooling services in one efficient operation. Piping is confined to skid for maximum protection.

CLARK

SMART ECONOMY!

HALLIBURTON'S SAND-WATER

SAFE...EFFICIENT FRACTURING TREATMENT

Using fresh or salt water or oil field brines as the base fluid, Sand-Water is economical . . . and is non-combustible.

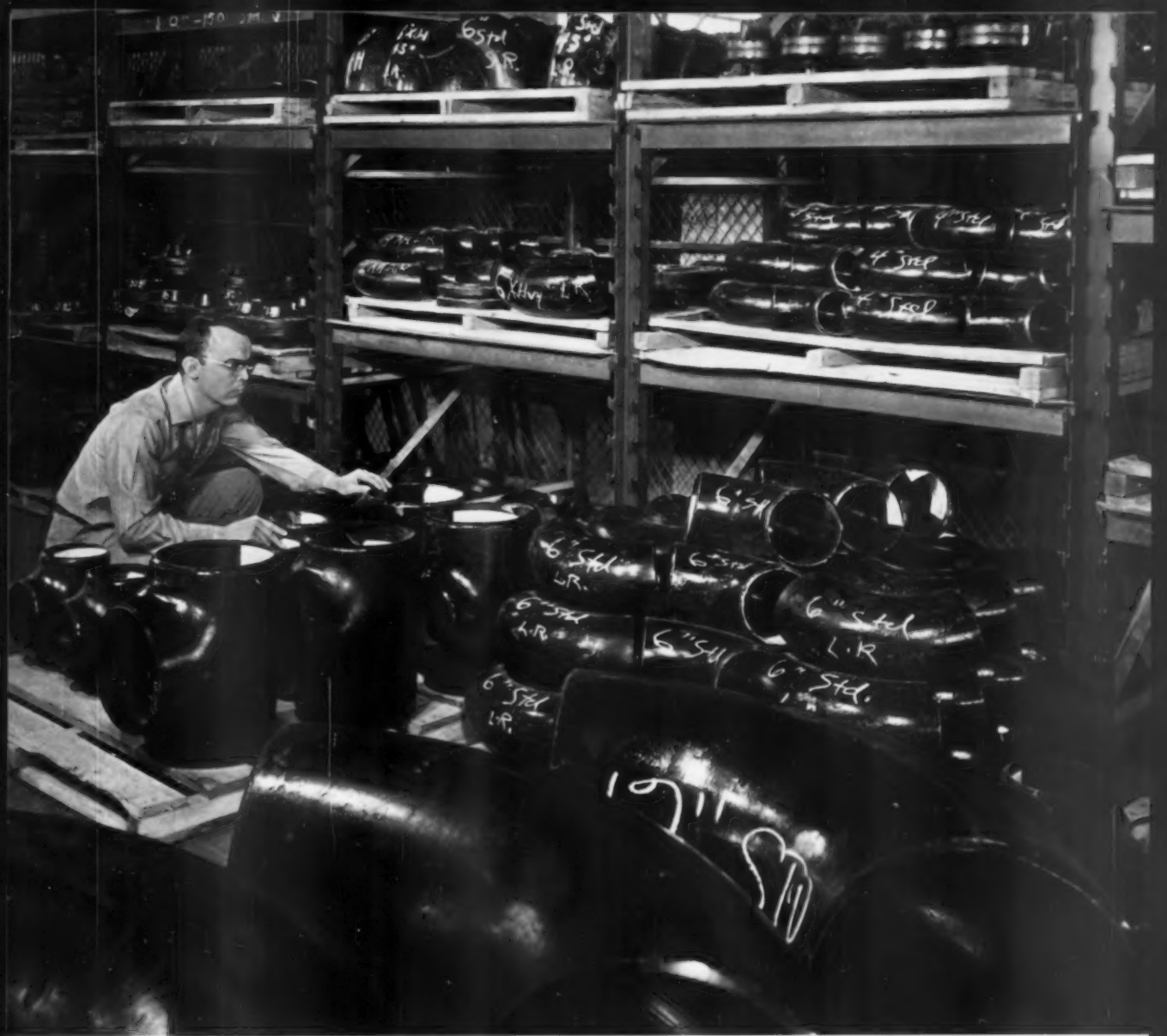
Sand-Water fracturing treatment has resulted in substantially increased and sustained production in thousands of wells. Although used most often for gas wells, Sand-Water is being adapted to many oil wells where formations are compatible with water-base fluids.

Water loss is reduced with Halliburton's specially designed additive, WLC-1, permitting the introduction of large volumes of sand and water into the formation . . . the key to Sand-Water's fracturing effectiveness. Halliburton's fracturing equipment provides the mechanical means of injecting these volumes into the well for reservoir stimulation.

You'll find Sand-Water hard to beat for advantageous treatment of wells where conditions indicate its use. Check with Halliburton . . . Get the best treatment for your well!

HALLIBURTON OIL WELL CEMENTING COMPANY
Duncan, Oklahoma

FIRST IN FRACTURING...RESEARCH AND RESULTS



Tube-Turn fittings are typical of the line of quality equipment stocked and distributed through National's 130 stores.

You say you want complete stocks?

If you've had problems getting stock fittings and parts in a hurry, National Supply can solve them. Stop in and see the complete stocks of Tube-Turn fittings and other quality products we maintain . . . and take your time looking around. The doors and gates to our store, warehouse, equipment yard or pump shop are always open, and it will pay you to walk in and get better acquainted with our store people and the stocks they offer. We've built counters in the fronts of our stores for convenience—not as barriers.

As you walk back and around, you'll see ample stocks of products like these Tube-Turn fittings, Rockwell-Nordstrom valves, Ajax Engines, Oilmaster pumps and Link-Belt chain. The list of outstanding equipment is a long one, and we're pleased to be associated with every name on it.

More important than complete stocks is the fact that this is equipment you can use to operate profitably. Having it ready for you, when and where you need it, is our business, and we have 70 years of experience in it.

The next time you stop in a National Supply Store, shop behind the counter, too.

NATIONAL

"Extras" and "Special Features" in other units are STANDARDS in National Pumpers!

EXAMPLE: ACCURATE COUNTERBALANCING Because of the geometric and concentric design of cranks and counterweights, National Pumpers allow the best counterbalance—at a leading or lagging condition *as well as at mid-stroke*—you can obtain today. Counterweights can be quickly and safely adjusted by one man, in a method that's far superior to slab adding or subtracting systems.

EXAMPLE: GEAR REDUCER DESIGN—National gear reducers meet or exceed all API specs, and can be rotated in either direction. This permits more latitude on prime mover placement, and extends the life of the reduction unit. Other units without proper geometric design or with one-direction lube systems can't use reverse rotation for these benefits.

EXAMPLE: GROUND LEVEL LUBRICATION—This is a desirable *standard* safety and convenience feature in all National Pumpers for which you pay no extra charge.

EXAMPLE: ARC HANGER DESIGN—National's arc hanger has a hinge which allows you to fold it back for unhindered well servicing. It also has self-adjusting features which prevent side loading, polish rod bending and excessive wear on stuffing box packing. Many other pumpers lack these practical, economical features.

EXAMPLE: CRANKS—The gear reducer is placed on sub-base on crank-counterweighted National models. This places it at a height which prevents the weights from traveling below the unit base, and thus eliminates side pit digging for proper clearance. Split cranks are used for easy field removal and replacement—no solid cranks to cause extended down time, transportation and machine shop expenses.

EXAMPLE: BEARINGS—National provides the best frictionless bearings for the loads and motions involved in pumping unit operation—straight or tapered style roller bearings on all fully rotating shafts, and proven needle type bearings at points where limited or oscillating motions are present. These bearing selections mean minimum horsepower losses through the unit and greatly increased bearing life.

EXAMPLE: DUST SEALS—National Pumpers have dust excluders on all bearings to improve the life of oil seals and bearings. Dust seals on shafts rotate with, but do not touch, the shafts, and are extremely efficient.

EXAMPLE: OVERALL STABILITY—National Pumpers have wide spacing of the samson post's four legs plus cross bracing. This makes them far less susceptible to twisting or stressing due to improper unit setting than units of small leg spread, three-leg construction or without cross bracing.

There are many more specific examples which prove that the best pumper investment for lowest operating costs is National. The National man in your area will tell and show them to you any day you choose.

National Pumpers are available in 22 standard API sizes, plus several long stroke and portable variations.

More National equipment for profitable production on next page

Precision manufacturing operations and painstaking inspection methods insure the traditional quality in every finished National Rod shipped to the field.

You get low-cost sucker rod service with a National String!

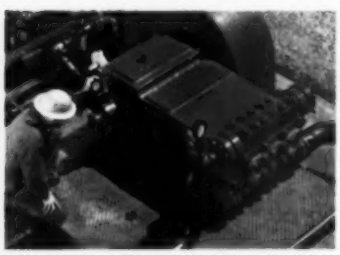
There are three main reasons. National Sucker Rods are:

1. **ENGINEERED** for maximum resistance to shock, corrosion, fatigue and impulse loads.
2. **QUALITY-CONTROLLED**—from laboratory testing of sucker rod steels to final shipment inspections—to give you the ultimate in uniformity, dependability and economy.
3. **PRECISION-MANUFACTURED** on specially-developed machines—in accordance with the strictest specifications in the industry.

National Rods reach you in factory condition, too, whether you get them from National Supply Store stocks or directly from the mill. National's careful methods for stacking, handling, shipping and field storage have been proved by hundreds of shipments to all parts of the world.

Of course, National has a rod grade for every well condition—normal, mildly corrosive, heavy corrosive or sulphide wells. National Hollow Sucker Rods and Plastic-Coated Rods are also available for special conditions.

From any standpoint, the choice of a National Sucker Rod string means low-cost sucker rod service. You'll find it worthwhile to review your rods needs with the National Supply field man in your area.



National Triplex Pumps are reliable on a host of oilfield pumping jobs including waterflooding, salt water disposals, formation fracturing, and as power-oil sources for subsurface hydraulic pumps.

National Wellhead Equipment features interchangeable units which provide many combinations for your specific size, capacity and type needs. Ease of assembly and pre-tested safety are two of its outstanding advantages.

National Plunger Lift can be the best production method for certain types of wells. It uses formation gas or injected gas for operation, has low initial and service costs. Equipment is also available for gas well operation to remove liquids and maintain a uniform and increased flow rate of gas.

THE **NATIONAL SUPPLY** COMPANY
Two Gateway Center, Pittsburgh 22, Pa.
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Seeing is believing . . .

E P MUDLUBE

Brand Mud Additive

. . . PREVENTS BEARING SEIZURE

— under high load . . Bits last longer . . . fewer bits . . . fewer round trips . . . more footage per tour

. . . REDUCES DRILLING TORQUE

Lubricates drill pipe and protector surfaces . . . less power to rotate pipe

. . . ADDS LIFE TO EQUIPMENT

Lubricates pump piston and cylinder surfaces . . . less wear on all equipment

new way to cut drilling costs

E P. MUDLUBE is an oily liquid that is emulsified in drilling mud. Its effect is to impart to the drilling mud extreme pressure lubricating properties that minimize bit bearing seizure under conditions of high loading. This lubricating property effectively reduces friction at other points of surface-to-surface contact such as drill pipe and casing protector to hole-wall and pump-piston to cylinder-wall.

Another new product, EMULSIFIER SMB, is available when needed to emulsify the E P MUDLUBE in the drilling mud.

Baroid's Portable

E P MUD TESTER ...

New E P MUD TESTER . . . especially developed by Baroid as a portable field instrument . . . enables field personnel to make immediate, reliable recommendations of the amount of E P MUDLUBE to add initially and when more is needed to obtain optimum mud lubricating properties.

All Baroid testing equipment can be ordered from your Baroid Service Engineer. Contact him today.

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

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BAROID DIVISION • P. O. Box 1675, Houston 1, Texas
Please send data on E P MUDLUBE and TESTER PE

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COMPANY _____

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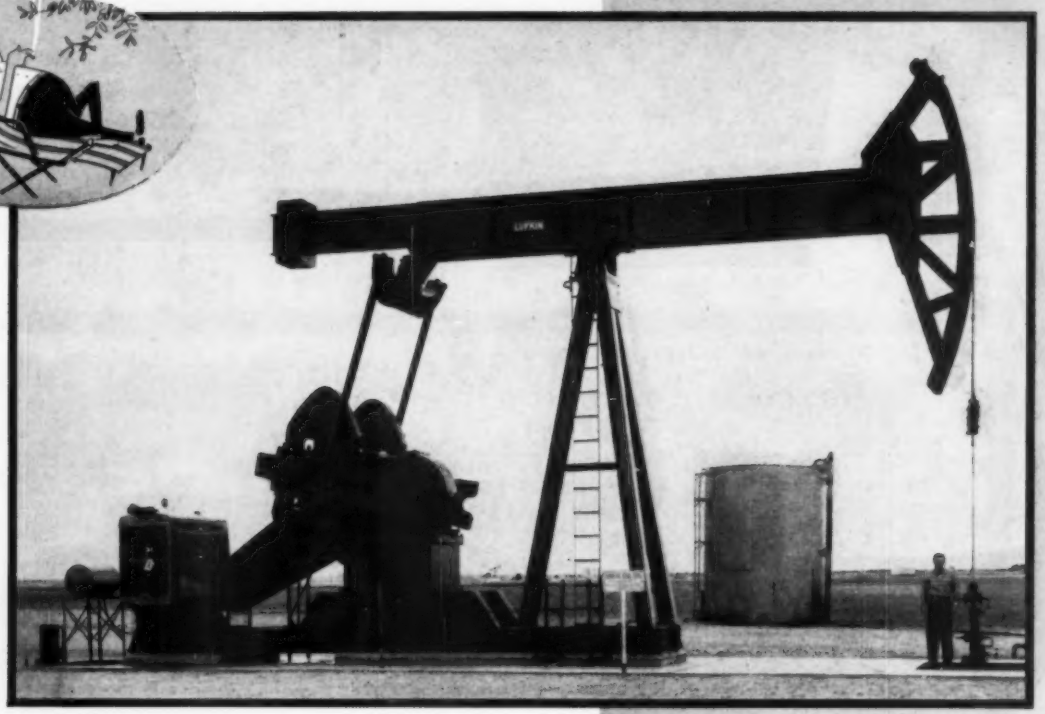
LUFKIN...

sets another WORLD RECORD!

● **It's only natural that the world's *finest* unit was selected for the world's *deepest* sucker rod pumping job**

You Can Relax When Your Lease Is **LUFKIN EQUIPPED**



▲ **THE MIGHTY LUFKIN CB-912DA-168-32 PUMPING SHELL OIL COMPANY'S STATE G.A. #5 IN THE CAUDILL FIELD NEAR LOVINGTON, NEW MEXICO**

PUMP SETTING 13,200 FEET!

Pump Size — 1¼"
Tubing — 2½" and 2"
Rods — 1", ⅞", and ¾"
Pumping Speed — 9 S. P. M.
Stroke — 168"
Production — 125 B. P. D.

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I'M GLAD THIS RIG HAS WECO IRON!

Good "Iron" can make the difference between profit and loss on a drilling contract. Crewmen like to work with equipment that is safe and able to "take it" without special handling. Operators and owners are happy to add up the savings in time and money that come from using quality "iron."

WECO Unions are good "iron." Full-circle metal-to-metal contact sealing of WECO's ball and cone seats holds the highest pressures under all conditions of surge and vibration. Tough, strong nuts and subs forged or cast from high grade steel give long service, even under the hard usage of today's competitive drilling programs.

WECO Unions available in sizes 1" through 12", in pressures from 1,000 through 15,000 psi.

Sold by Supply Stores Everywhere.

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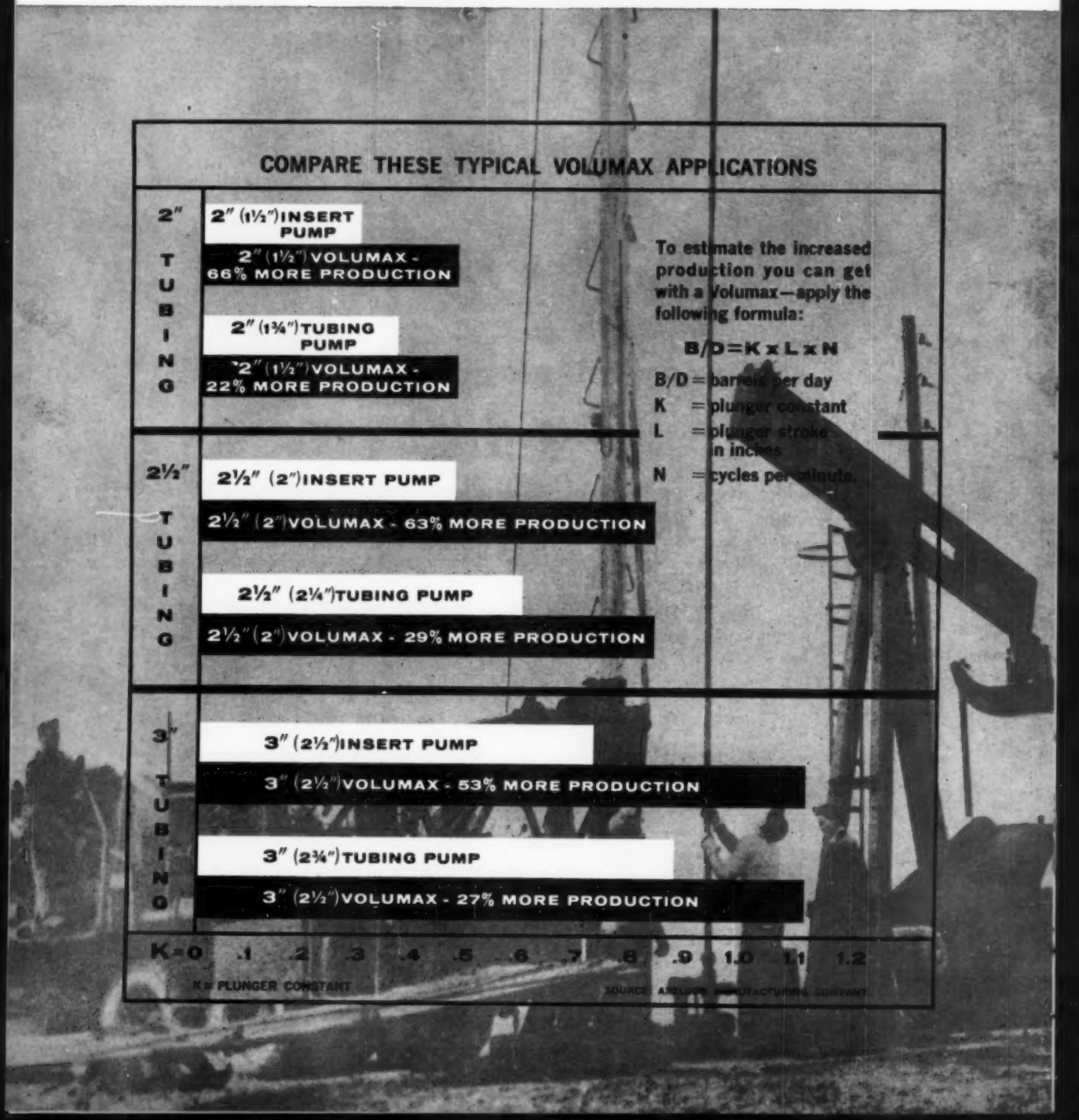
WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

NOW-AXELSON'S

Insert Pump


COMPARE THESE TYPICAL VOLUMAX APPLICATIONS
2" TUBING
2" (1½") INSERT PUMP
2" (1½") VOLUMAX - 66% MORE PRODUCTION
2" (1¾") TUBING PUMP
2" (1½") VOLUMAX - 22% MORE PRODUCTION
2½" TUBING
2½" (2") INSERT PUMP
2½" (2") VOLUMAX - 63% MORE PRODUCTION
2½" (2¼") TUBING PUMP
2½" (2") VOLUMAX - 29% MORE PRODUCTION
3" TUBING
3" (2½") INSERT PUMP
3" (2½") VOLUMAX - 53% MORE PRODUCTION
3" (2¾") TUBING PUMP
3" (2½") VOLUMAX - 27% MORE PRODUCTION
To estimate the increased production you can get with a Volumax—apply the following formula:
B/D = K x L x N
B/D = barrels per day
K = plunger constant
L = plunger stroke in inches
N = cycles per minute.
K=0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2
K = PLUNGER CONSTANT
SOURCE AXELSON MANUFACTURING COMPANY

NEW VOLUMAX

Outproduces Tubing Pump

It's a fact: **Without changing your pump stroke, Axelson's new Volumax will outproduce *any* tubing pump run in your well.**

By expanding the pump chambers Axelson's Volumax makes possible an average volume increase of 22% over a 1¾ bore tubing pump and 66% over the largest ordinary rod insert pump in 2″ tubing (1½ bore).

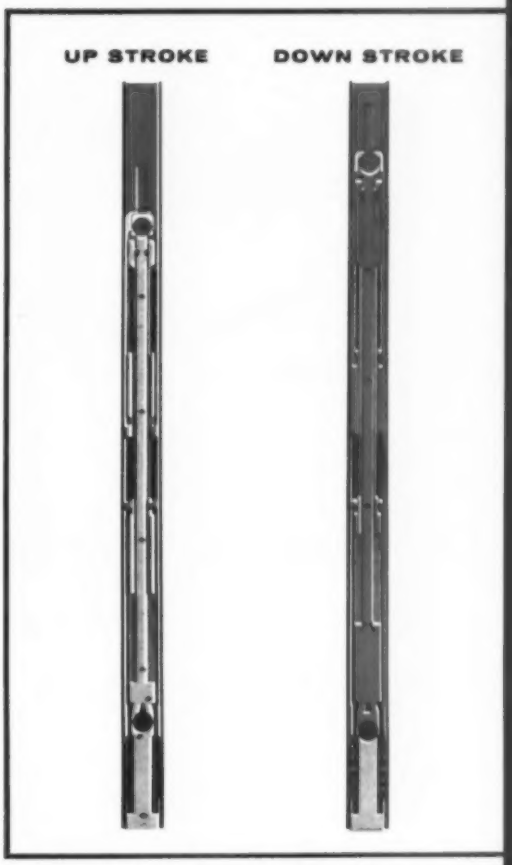
VOLUMAX gives you more because:

1 **It's an insert pump; tubing need not be pulled.**

2 **More production than a tubing pump at *identical* strokes per minute (excellent where large volumes of water must be lifted).**

3 **Identical production as a tubing pump at *fewer* strokes per minute, this means longer sucker rod life because of fewer reversals of stress.**

Write for the new VOLUMAX brochure.



Enlarged annular area offers maximum productive flow

AXELSON

There is no economical substitute for quality

AXELSON MANUFACTURING COMPANY

Division of U. S. Industries, Inc.
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Since 1898
products designed to give oil a lift

AXELSON PRODUCTS ARE DISTRIBUTED EVERYWHERE

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MID-CONTINENT AND EASTERN **Jones and Laughlin Steel Corp., Supply Division, Tulsa**

ROCKY MOUNTAIN **Jones and Laughlin Steel Corp., Supply Division, Tulsa**
Great Northern Tool and Supply Co., Billings

CANADA **Jones and Laughlin Steel Sales Co., Ltd., Supply Division, Calgary**
Dominion Oil Fields Supply Co., Ltd., Calgary

FOREIGN **Represented in all major oil-producing areas.**

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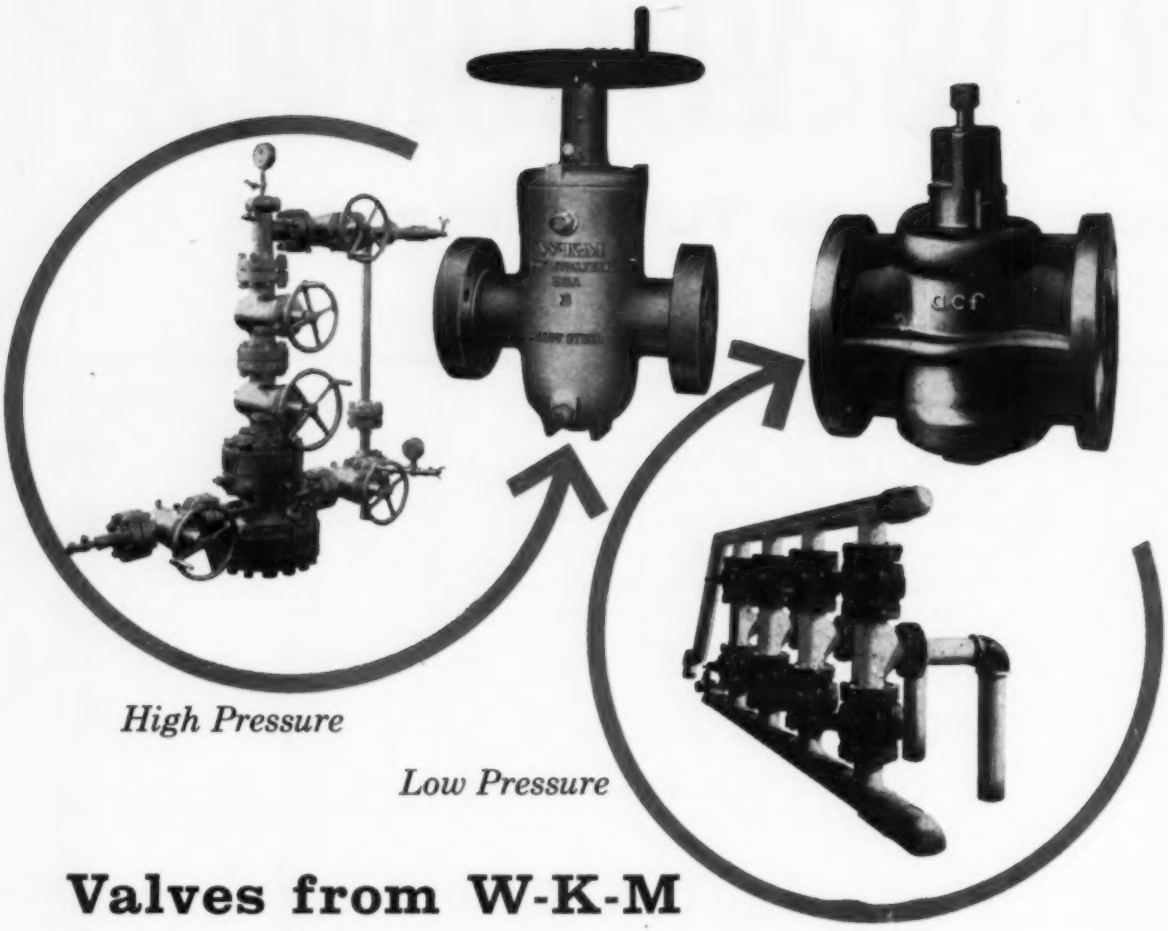


High Pressure

Low Pressure

Valves from W-K-M are noted for efficiency, low maintenance costs, easy operation

W-K-M Through-Conduit Gate Valves are famous for the safe, positive control of high pressures. They are preferred for conventional or multiple completion trees, flow lines, or wherever working pressures range from 500 to 15,000 pounds.

acf Lubricated Plug Valves—of steel, semi-steel and special metals—with round or rectangular ports—are specified for working pressures between 200 and 500 pounds on gathering lines, manifolds, headers, and similar low-pressure installations.

Valves from W-K-M are designed, built and serviced by men who know the oil fields.

On Hand

Order both W-K-M Gate Valves and ACF Lubricated Plug Valves from your supply store . . . W-K-M field service men are everywhere there's oil!

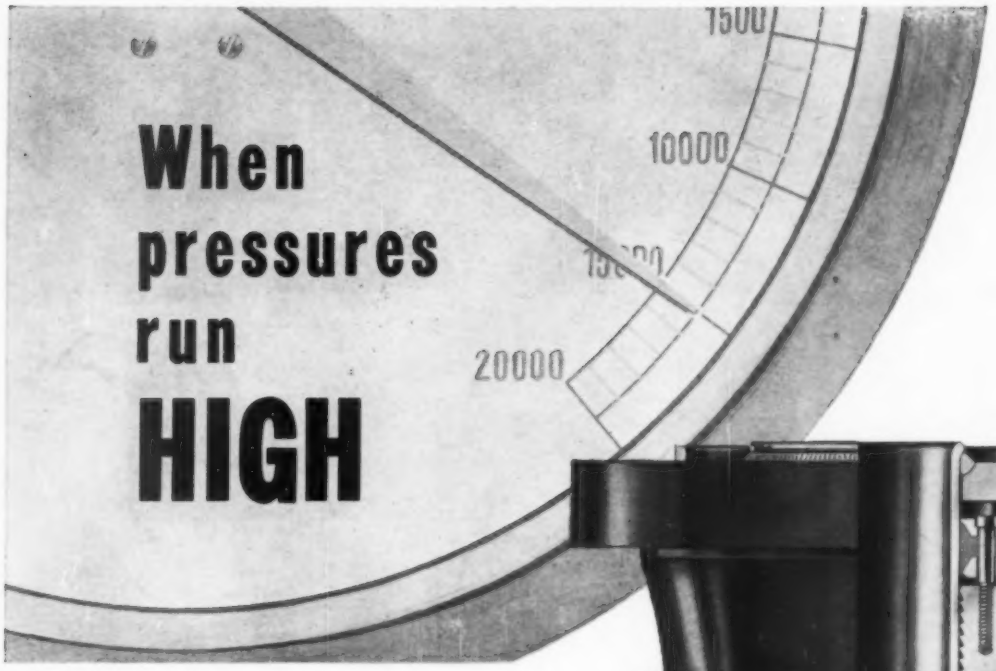
W-K-M

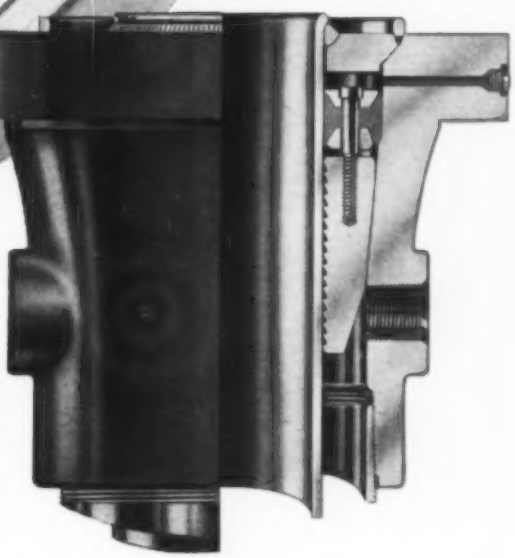
DIVISION OF acf INDUSTRIES INCORPORATED

P. O. Box 2117, Houston, Texas

W-K-M's *Creative Engineering* can assist you with any special problem. If it involves flow of fluids or gases through valves, check first with W-K-M.

5801





Your Well Is Safe With

RECTORHEADS

the head that seals with the Ring-of-Steel

More than 125,000 Rector casing head installations prove that you can forget about pressure leaks when your well is equipped with Rectorheads. For working pressures to 15,000 psi . . . regardless of temperature extremes . . . the Rector ring-of-steel provides a lifetime seal.

There is no resilient packing to flow under pressure or deteriorate from heat or time. The casing is welded to a steel ring that fits in a precision ground seat. There is no stress on the weld when the flange bolts are tightened. A steel API ring gasket completes the permanent, maintenance-free seal.

For well safety and long range economy, specify RECTORHEADS . . . now in sizes through 20". Order from your favorite SUPPLY STORE.

RECTOR WELL EQUIPMENT COMPANY INC

★ MAKING THE OIL INDUSTRY SAFER

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

EXPORT REPRESENTATIVES: Continental Supply Company • Mid-Continent Supply Company • Oil Well Supply Company

another Eastman contribution to saving drilling time and expense

Two cutter badger jet drilling assembly with Eastco Button Stabilizer.

Eastman Badger Jet...

A new deflection tool to save drilling time and expense in soft formations

Named after the fast burrowing badger, this new exclusive Eastman development has been thoroughly tested and proved at Long Beach and along the Gulf Coast. Wherever there are soft formations this new Eastman Badger Jet with its simple, rugged construction and improved orientation will do the deflecting job faster and better... another fine example of Eastman's program .....

... dedicated to progress through advanced engineering ... research ... and service to the Petroleum Industry.

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HOMCO

HOUSTON OIL FIELD MATERIAL COMPANY, Inc.

Backs Up 30 Years Of Directional Drilling Experience....

With Research and Engineering...

HOMCO's fully staffed Research and Engineering Department is constantly searching for — and testing — new Directional Drilling tools and methods.

With Top Management...

Executives of HOMCO know the oil business. They have been a part of it for 30 years or more. They know what the customer needs — and how to help him.

With Teamwork...

Direct liaison between the Engineers in the field, division headquarters and headquarters in Houston, assures the customer of a fully coordinated program. This team collaborates in advance the planning of any Directional Operation, subject to last-minute revisions by the Engineer in the field.

With Modern Equipment...

HOMCO Equipment is modern and fully tested — for example — the HOMCO Stabilizer and HOMCO Orienting Equipment. HOMCO Directional Drilling Tools and methods are proved where it is most important — in the well.

With Communications...

HOMCO has a complete communications system, including micro wave relay stations, rig-to-shore-to-rig radio, teletype, and two-way radio installations in cars and trucks.

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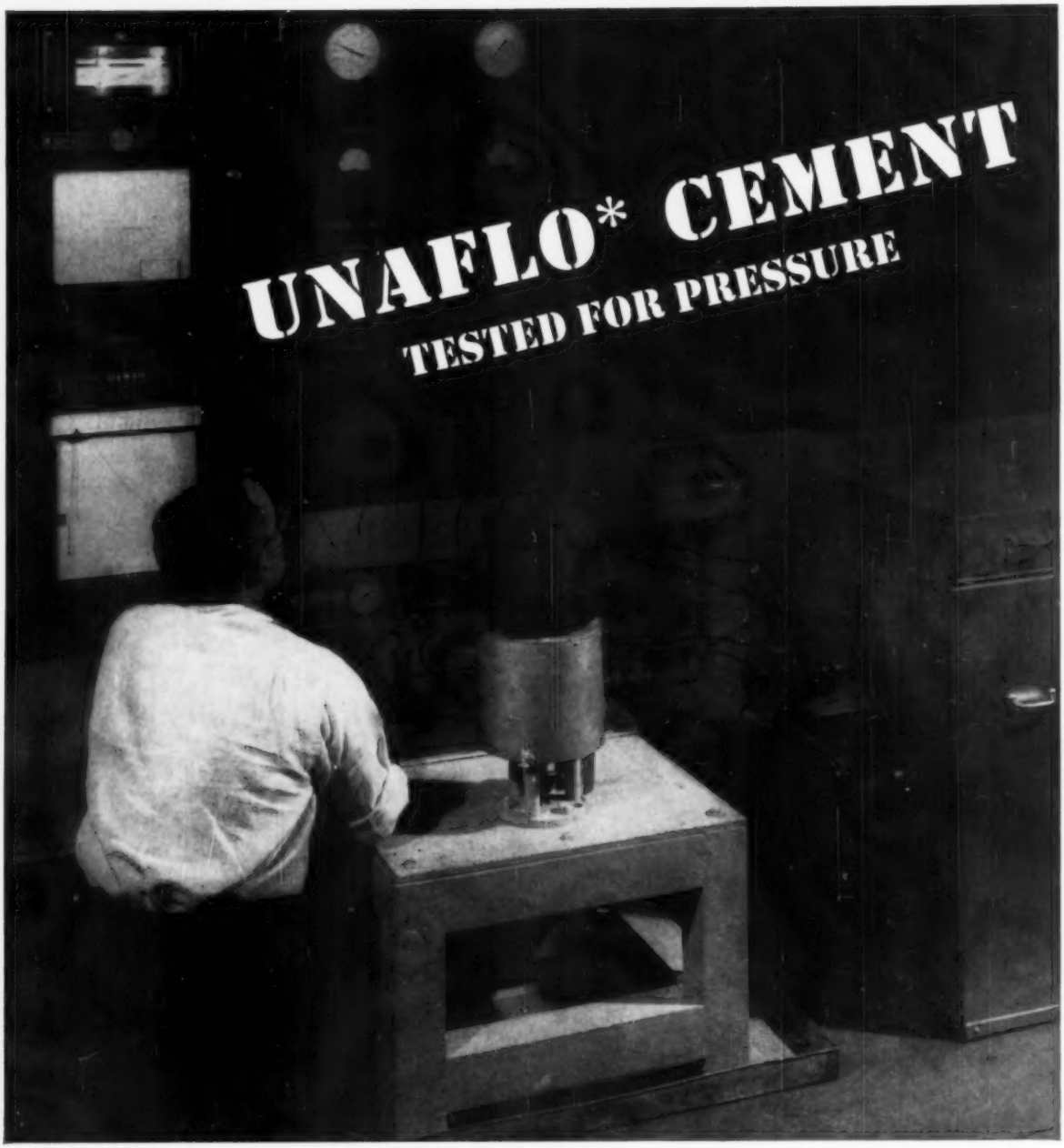

Apparatus used to cure cement specimens used in heat of hydration, permeability and absorption tests. Pressure vessel in foreground simulates these well conditions: temperatures from 80° F. to 400° F. and pressures from atmospheric to 10,000 psi.

- Careful attention to product testing of UNAFLO retarded oil-well cement pays off in down-the-well dependability.
- UNAFLO slurries pump easily, and stay pumpable under high bottom-hole temperatures and pressures, giving vital extra time in case of emergencies.
- After its retarded period, UNAFLO cement hardens normally to form a strong, well-bonded structure that is watertight and resistant to sulphate waters.

For typical data tables, write: Universal Atlas, 100 Park Avenue, New York 17, N. Y.

*UNAFLO is a registered trade-mark

U-156

UNIVERSAL ATLAS CEMENTS

Universal Atlas Cement Company

Subsidiary of **United States Steel**

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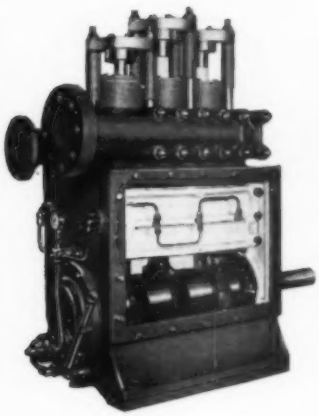
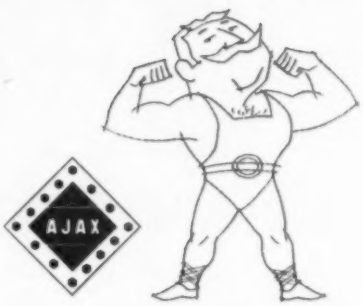
3 Great Performers—

IN THE FLUID INJECTION FIELD!

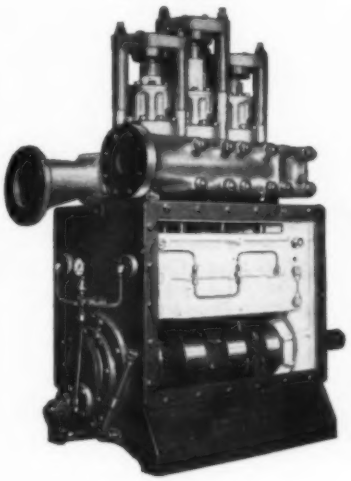
TRIPLEX 4000 PUMP



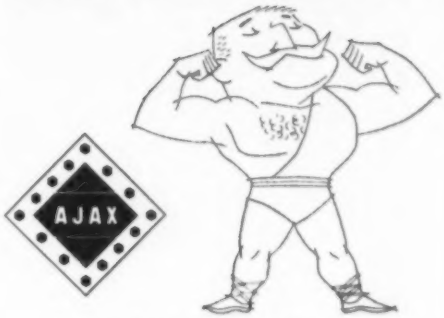
5.2 to 123.5 gpm
Pressures 4980 to 835 psi



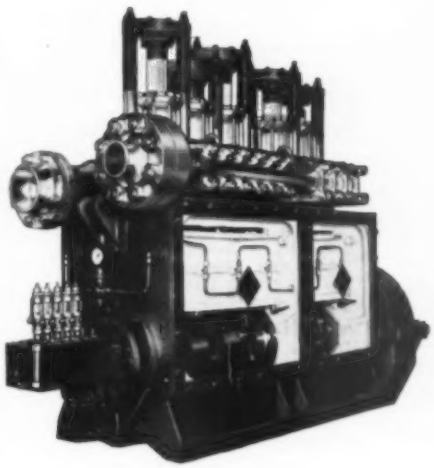
TRIPLEX 5000 PUMP



9.6 to 258.2 gpm
Pressures 4940 to 665 psi



QUINTUPLEX PUMP



16.0 to 430 gpm
Pressures 4940 to 665 psi

Ajax Vertical Pumps offer a broad range of capacities for fluid injection and down-well pumping demands, with unfailing dependability for pressure maintenance around the clock. In the years since their introduction, Ajax Triplex Pumps have led the field in stamina and low maintenance on the toughest pumping jobs. The new Ajax Quintuplex brings high capacity with the same Ajax top quality construction—and is the *first* pump to feature a crankshaft mounted on THREE double-row, tapered anti-friction roller bearings. Typically AJAX . . . ask your Supply Man for descriptive bulletins!

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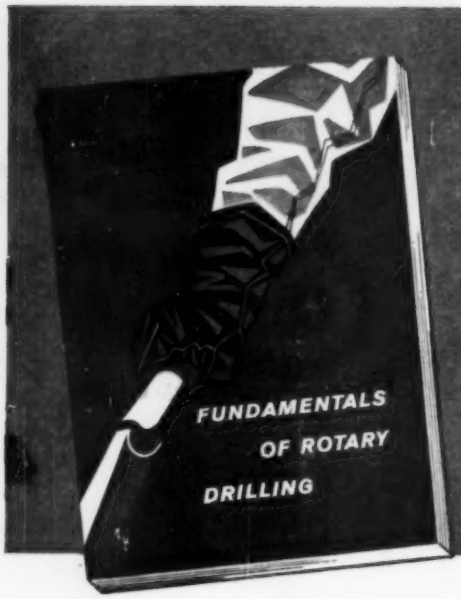

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"We have recently received a copy of your reprinted 'Fundamentals of Rotary Drilling.' This appears to be a very handy reference and we should like to know whether further copies may be obtained for our field and office group." **General Manager, San Fernando, Trinidad, B.W.I.**

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FRAC HEADER HAS UNIQUE SAFETY FEATURES

DOWELL ENGINEERS have designed, tested and put into use a new type frac header for oil and gas well fracture treatments. This header is the result of a two-year research and field development program to minimize the hazards that are always present on high volume — high pressure fracture treatments. Approximately thirty of the headers are now in use and more are on order for early delivery.

The header is fabricated from AISI 8630 steel and subjected to several specifications and testing procedures. Final tests are equivalent to the federal tests for armor plate. Each casting is subjected to 100 percent radiographic and magnaflux analyses. After heat treating, all parts have a Brinell hardness averaging 255 and a minimum yield strength of 100,000 psi. The assembled header is tested at 7000 psi on casing and 10,000 psi on tubing.

There are three basic parts of the header: Casing adapter, cross, and "goat head." These can be assembled to provide all necessary wellhead connections. The "goat head," of heavy duty machined steel, has three 2½-in. openings. Several of these parts can be assembled on the cross to provide multiple connections to the pumping equipment. Acme threads are used on all connections except the casing adapter.

Each "goat head" contains a heavy-duty built-in check valve that will allow the passage of 50 bbl of fluid per min with a minimum of friction loss. The specially designed, spring-loaded check valves are an important safety feature. They serve to prevent the back flow of fluid in case of a break in any one of the numerous lines connecting the pumps to the header.

British Petroleum Opens New Lab

ONLY ONE OF ITS KIND IN THE COMMONWEALTH

THE RECENT MOVE of The British Petroleum Company's exploration and production research laboratory from Kirklington Hall, one of England's old and stately homes near Nottingham, to a new specially built laboratory block at Sunbury-on-Thames, 20 miles from London, concentrates the great majority of BP research at Sunbury.

The laboratory, only one of its kind in the Commonwealth, was established in 1947, close to the United Kingdom's only commercial oil fields. It gradually outgrew its accommodations, but in the new building it now occupies, there is ample room for expansion as well as the most modern facilities and equipment for research.

Briefly, the functions of the laboratory are to examine and develop methods, techniques, instruments, and equipment for: (1) Exploring and prospecting for oil; (2) Investigating reservoir characteristics of fluid content and flow; (3) Physical characteristics of oil in place; (4) Estimating the extent, probable recoverable reserves, and most economical methods of development and exploitation of an oilfield; (5) Investigating suitable methods and timing of secondary recovery, where applicable, and (6) Dealing with the economical separation of high pressure oil and gas mixtures at the well head to produce the maximum quantity of optimum quality stock tank oil suitable for storage and transport.

The laboratory is also concerned with assisting field parties with problems which are beyond the scope of their field facilities.

Work in the laboratory is carried out by several sections, one being the geological research section, which also embraces geochemistry. Various methods and apparatus are employed to study material that cannot be examined in the field.

In the palaeontological section detailed examination is carried out of outcrop samples collected by geologists in various parts of the world, as well as on samples from information borings and test wells. A thorough search is made of samples for fossils. The palaeontological work includes palynology, the study of fossil spores and pollen.

Research and development into geophysical methods of prospecting for oil and in the instruments required are carried out by another group, the geophysical section. Most of the effort of the section is devoted to seismic surveying. For this work, the section is equipped with field recording apparatus, including magnetic tape recorders, and also extensive equipment for fully analyzing the records obtained Many of the section's facilities are employed in devising new or improved instruments and in modifying existing field techniques and instruments to suit the conditions of the areas in which BP is looking for oil.

Physical and mechanical testing facilities at Sunbury permit making such tests as shaking complete pieces of equipment, freezing them or subjecting them to high temperatures, and checking how they withstand fungus growth and high humidity.

Research work is also being carried out to develop a gravity measuring instrument which will go down a deep borehole. If and when successfully developed, this instrument will extend the range of gravitational observations deep into the earth and also provide data which should improve the accuracy of surface gravitational observations.

Measurements on reservoir rocks, oils, and gases, and the predictions of production performance, are the responsibilities of the petroleum engineering section. Within the section, one group deals with mud and chemical additives when mixed with typical drilling fluids. Another group studies the oil production performance of oil fields and predicts their future potentialities.

The logical last step in the research done in the new laboratory at Sunbury is that concerned with production engineering. This section is responsible for the study of separation processes and the design of plant and equipment for efficient separation. Research is also carried out into the more fundamental physical properties of gases and crude oil and their individual components, with special reference to underground reservoir conditions.

"THERE'S ONE TESTING COMPANY THAT ALWAYS GIVES YOU SOMETHING EXTRA..."

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Experience means less rig time, less chance of a misrun, more accurate evaluation, complete and reliable bottom hole data. These can be translated into dollar savings for you, the operator.

Why does Johnston usually get the call for the tough drill stem tests, the deep, difficult holes? The answer is simply this. With Johnston equipment, rugged enough to withstand any hole condition, you're assured of the best possible results. The Johnston pressure recorder, the most sensitive and accurate recorder available, gives exacting information. With Johnston personnel, service and test evaluation is the best obtainable.

Give your well every chance to be a producer. The margin for error is reduced when you rely on Johnston experience.

Always call Johnston and be sure.

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A World Of Experience

JOHNSTON TESTERS

Other Equipment

Down-Hole Connection Tool

351 Bowen Itco has introduced "Quick Lok," a tool for down-hole connection adapted to gas lift servicing, pulling chokes and wireline fishing operations. The device allows tools to be changed without removing completely from the lubricator. Changing tools requires only lifting the lubricator, exposing the top connection on the bottom tool, releasing the "Quick Lok," and making up the next tool. The tool is constructed of stainless steel and consists of only 4 pieces — body, pin section, slide, and slide spring.

In operation, the tool body is made up to the bottom of the sinker bar or wherever a connection is required to be broken frequently. Pin sections are made up to the tops of whatever tools the job requires. After the body and pin sections have been made up to the sinker bars and tools, the first tool to be run is attached to the string. Pin section is then lined up with the body, pushed in, and rotated 90 deg either way until the slide on the body snaps into place. This effects a positive connection for withstanding pulling strains and jarring. *Bowen Itco.*

Atlas Pipe Expands Service Package

352 Through its most recent acquisition, the addition of Universal Inspection & Service Company as a division, Atlas Pipe Inc. and its divisions now provide a complete tubular goods "package" service which includes oil country tubular good finishing, full-range specialized inspection, pipe lining and coating, and production of high pressure tubing joints and couplings. Other Atlas divisions are Atlas Metal Protection, Inc., and Hardy-Griffin Engineering Corporation.

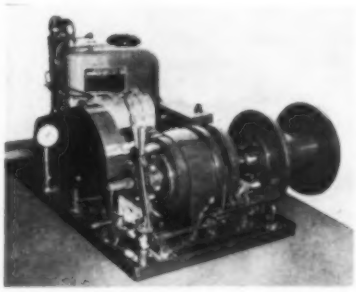
Atlas Pipe Inc., finishes tubular goods to API standards and specifications. Universal Inspection & Service performs electronic and optical inspection of tubing, casing and drill pipe in mills and shops, where tubular goods are being processed, or in the field. Atlas Metal Protection, Inc., provides a tubular goods coating and lining service, in addition to its other activities, which include spray coating and rubber and plastic lining of tanks, vessels, railroad tank cars, barges, and similar equipment. It also does liquid plastic coating, metallizing and related activities. Hardy-Griffin Corporation produces and markets a patented tubing joint and coupling, particularly suitable for high pressures and multiple completions and available in all regular tubing sizes as well as the smaller "macaroni" dimensions. *Atlas Pipe Inc.*

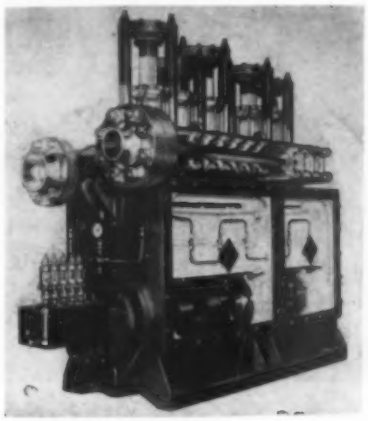
New Source for Mud Pumps

353 Jones & Laughlin Supply Division is now co-distributor of the Gardner-Denver line of power pumps for mud service in the United States and Canada, and will be the exclusive stocking distributor of parts. Teamwork between J&L Supply stores and offices and Gardner-Denver service specialists assures dependable service on pumps and parts throughout the United States and Canada. *Jones & Laughlin Supply Division.*

Detachable Spool Reel

354 C. A. Mathey Machine Works has developed a new reel with a detachable spool. Reel is available with extra spools for bottom-hole pressure buildups and it takes only a few minutes to detach or attach spools, thus permitting a single reel to be used at many well sites. The unit is available in all standard unit drives now manufactured and is powered by gasoline, diesel, air or electric motors. Spool capacities are 12,000, 15,000 and 18,000 ft of .072-in. wire line. *C. A. Mathey Machine Works, Inc.*





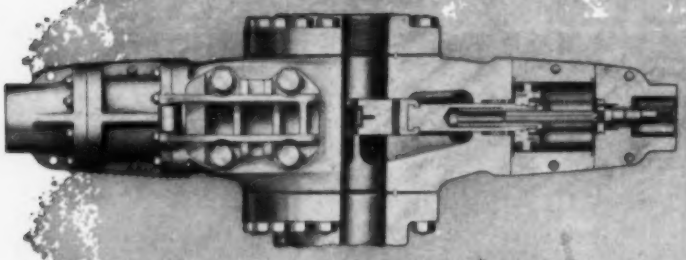
High Capacity Waterflood Pump

355 High capacity for water-flooding requirements is incoporated in the new Ajax quintuplex pump. Featuring 3 tapered double-row roller bearings on the crankshaft, permanently adjusted at the factory, the pump provides long life with low bearing loading in minimum space. Sectionalized fluid end, one-piece rigid frame, reversible nylon valves, pressurized lubrication, full-vision windows, maximum interchangeability of parts are additional features. When specified, a built-on factory installed speed reducer is also available. *Ajax Iron Works.*

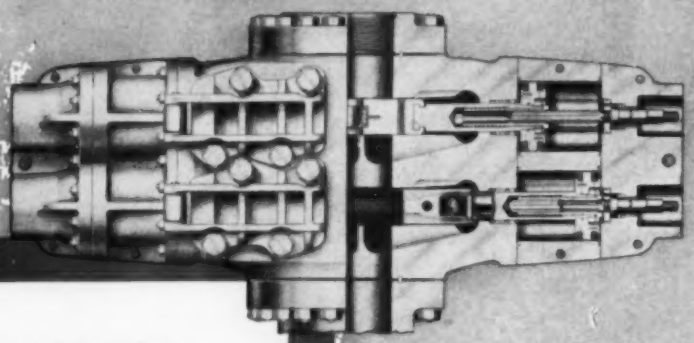
Paraffin Control for Pumping Wells

356 One of the latest methods of controlling paraffin in pumping wells employs Brakesol paraffin treating chemical. This chemical does not contain chlorinated solvents of any kind, nor does it contain arsenic, thereby conforming strictly to refinery specifications.

The treating hook-up was designed by Brakesol testing engineers to allow a small stream of oil to be pumped down the casing to carry the paraffin treating chemical. This is accomplished by means of a back-pressure regulator which holds a slightly higher pressure on the tubing than on the casing. This will maintain a column of oil in the tubing and will give enough pressure to overcome the casing pressure so that the chemical will go down rather than out through the flow line. *Brakesol.*



Here's the Shaffer Hydraulic SINGLE Cellar Control Gate with *Non-Rising* Locking Shafts for maximum compactness. You can use this Gate either alone, in assemblies of two or more, or in a combination hook-up with the Double Gate shown below.



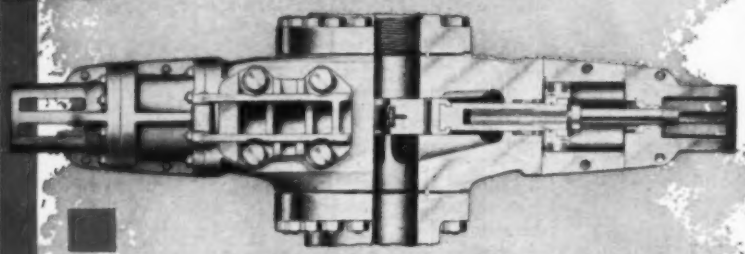
And here's the Shaffer Hydraulic DOUBLE Cellar Control Gate with *Non-Rising* Locking Shafts—the gate that unitizes *two* ram compartments into *one* compact body. Note how both the Single and Double designs have the same unique *side-opening* doors for unequalled convenience in changing rams!

SHAFFER

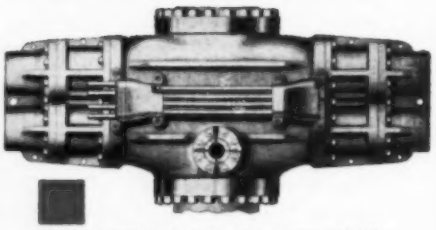
ADAPTS CELLAR CONTROL GATES TO FIT YOUR NEEDS!

Although Shaffer Hydraulic Gates incorporate the finest basic design in the industry, the design is still flexible enough to give you a choice of operating features to meet your particular *preferences.*

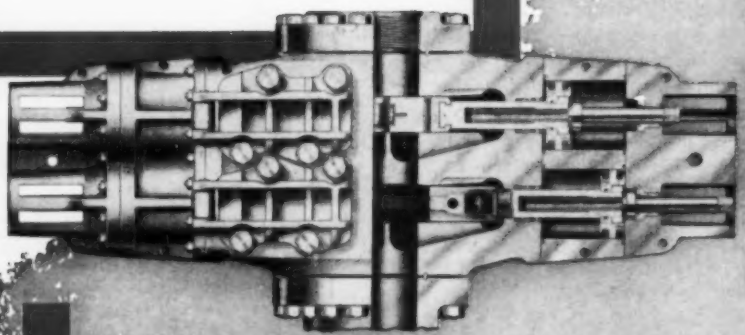
For example...



And here's the Shaffer Hydraulic SINGLE Cellar Control Gate with *Rising* Locking Shafts for maximum ease in checking ram position. It has the same advanced design as the units above—and most parts are interchangeable, size for size, thus simplifying inventory requirements.



And here's the back view of the Double Gates. No matter which of the four Gate designs you select, the hydraulic manifolding is as simple and clutter-free as shown here—and they can be had with built-in outlets to eliminate spools in the hook-up.



And if you want a DOUBLE Gate with *Rising* Locking Shafts, Shaffer has that, too. All designs are Completely Enclosed...all feature Direct Drive without yokes or complicated connections between pistons and rams!

35 years OF OIL TOOL LEADERSHIP

THIS IS ONLY PART of the complete Shaffer story on Control Gates built with **you** in mind. Call your nearest Shaffer representative for more facts—or write direct!

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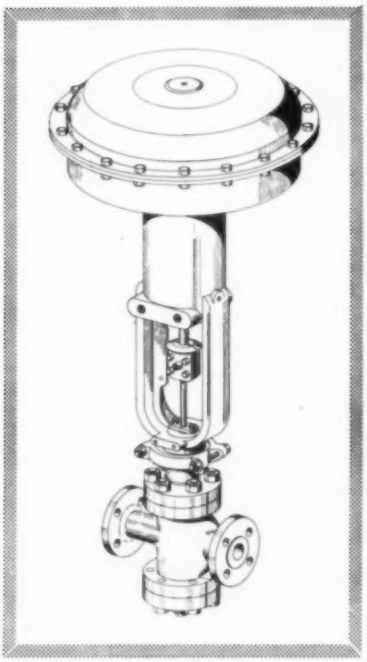
FARMINGTON, NEW MEXICO, Shaffer Tool Works, Post Office Box 546
CASPER, WYOMING, Shaffer Tool Works, Post Office Box 827
HOUMA, LOUISIANA, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.

Permanent Completion Hold-Down

357 Pacific Pumps, has developed a permanent-completion hold-down with maximum opening through the shoe to permit use of permanent completion tools through it. The sealing arrangement has replaceable stainless steel sealing ring with a reversible stainless steel sealing ring seat and can be used on any type API rod pump. If the stainless sealing ring seat, which is part of the tubing assembly, should become damaged or leak, an effective seal can be obtained without pulling tubing. The rod assembly is engineered and designed so that by replacing the spacer ring on the hold-down lock body with 3 ring type seating cups, the seal is transferred to the seat support nipple with the sealing ring and sealing-ring seat serving as a "no-go" ring and supporting the load. *Pacific Pumps, Incorporated.*

Control Valve Line Expanded

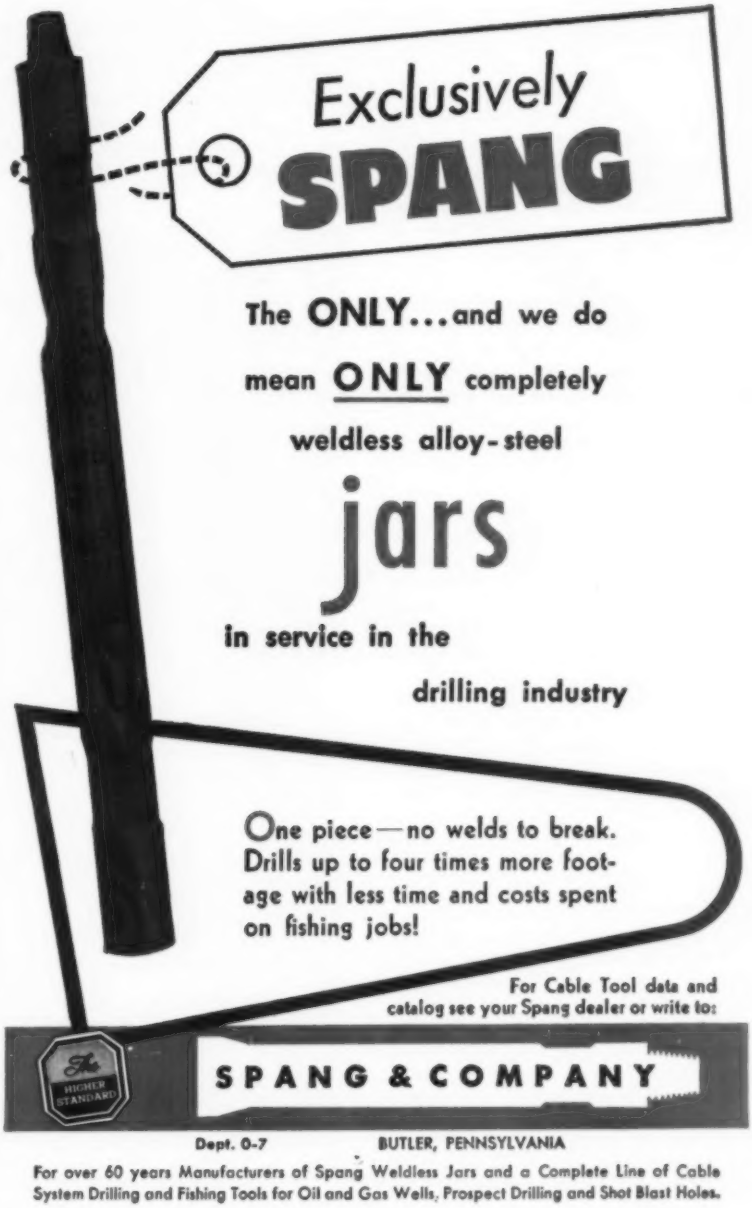
358 Marked expansion in the application range and material section of valve components have been incorporated in BS&B's Super 70 control valves. Improved valve efficiency and stability is noted in the design of the valves. The valves are available in float-ring-clamp ring closure or flanged-gasket closure. They are furnished with a constant effective area diaphragm actuator with maximum delivered thrust rated at 14,000 lb. *Black, Sivalls & Bryson, Inc.*



Portable Crack Detector

378 The United States Casting Repair Corporation has announced development of a new, completely portable crack detector. Based upon the principle of magnetic particle inspection, the detector will locate and outline any surface crack or fault on any ferrous casting. The unit will even spot fine hair-line cracks that are invisible to the eye. This unit weighs only 20 lb and is easily operated by 1 man. It can be operated from either a 110 a-c line, or 12-v or 6-v battery.

Complete unit includes probe, a-c and d-c connectors, sprinkling bulbs, grey magnetic powder, yellow magnetic powder and complete operating instructions, contained in steel carrying case. *United States Casting Repair Corporation.*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Hydraulic Unit Tests Drilling Methods

Full-scale laboratory drilling machine handles, tests regular drilling tools utilizing all hydraulic power

J. M. Camp
Research Engineer
The Carter Oil Company
Tulsa, Oklahoma

A FULL SCALE all hydraulically driven drilling machine to test the newly-developed tools and drilling methods at the Drilling Methods section of the Carter Research Laboratory (now Jersey Production Research Company), Tulsa, Oklahoma.

The machine is housed in a building with a 55 ft steel framed tower. It can be operated from a low level, or raised up into the tower as high as 44 ft, if testing a particular tool should require it. The hydraulic cylinders at each side pull down on the center column to which the bit is attached. This permits exerting a downward force on the drill bit of up to 50,000 lb.

Drill stem and bit are rotated by means of a rotary table, identical with conventional oil well drilling machines.

The rotary table for this machine is driven by an axial piston type fluid motor. This permits controlled torque applied to the bit and speed control of from 0 to 400 rpm.

Two axial piston pumps, one of which is a variable displacement unit, supply fluid for rotation. A third pump, a variable volume vane pump, is used to supply fluid as demanded to the hoisting and pull down cylinders. It is located overhead in a corner of the building.

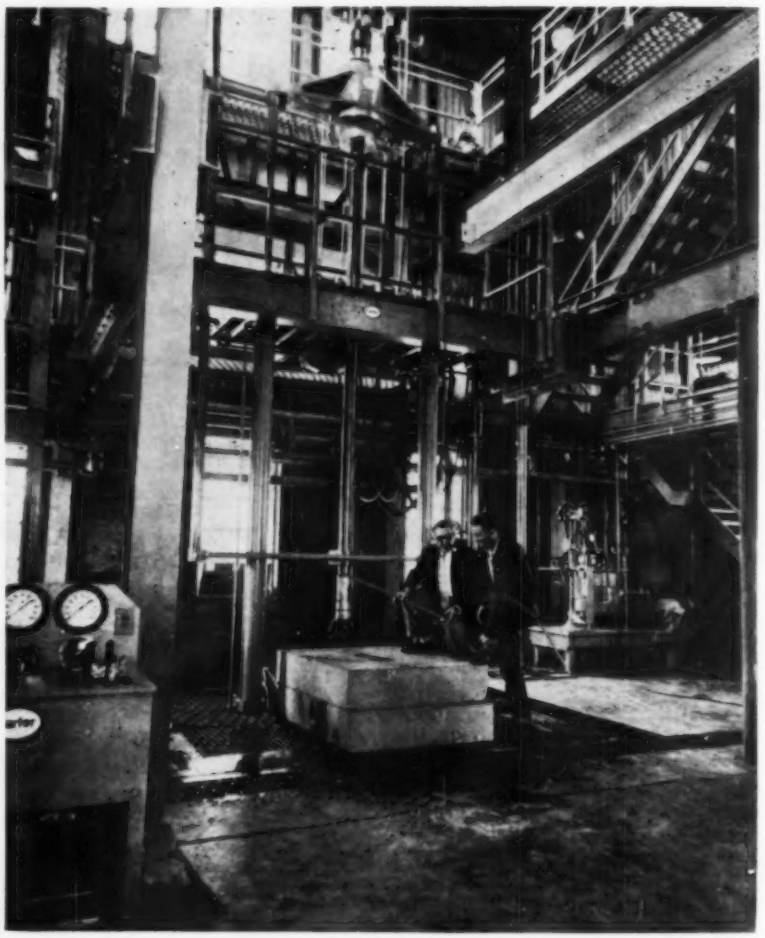
Hydraulic Systems

Hydraulic system of this machine is divided into two separate systems. One system for the two cylinders that pull down on the drill stem which applies weight on the drill bit. The second system is for rotation, and the two systems are independent of each other except for a common reservoir.

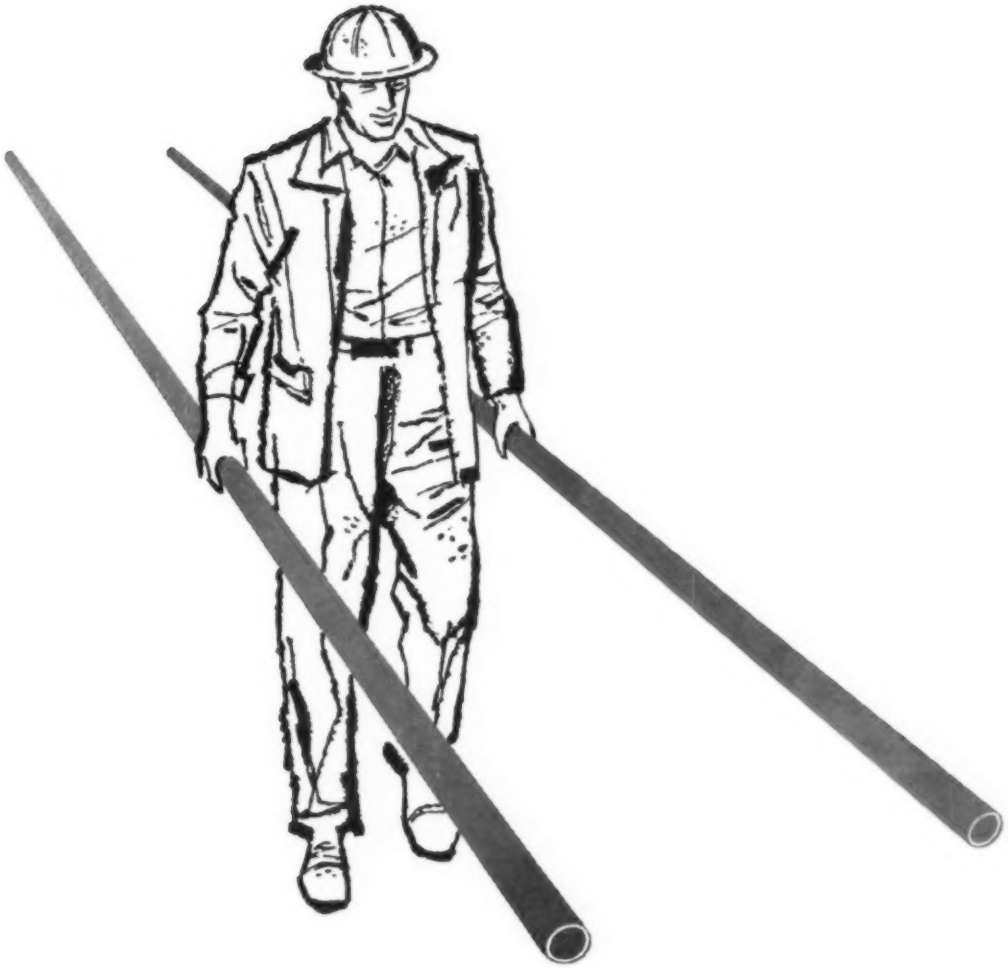
Pull Down System

Fluid for the pull down system is supplied by a variable volume vane pump, in a quantity sufficient to allow drilling up to 8 ft per min. The compensator in this hydraulic pump is controlled from the operator's control console by means of a remote control valve. The operator adjusts the remote control valve to obtain the desired pressure which applies the required amount of weight on the bit.

A check valve and counter balance is incorporated in the fluid line between the four-way valve and the cylinders. This permits free flow of fluid when raising the pistons and cancels out dead



New drilling machine is shown in place in the building tower, with the platform at its lowest position. John M. Camp at left, is discussing measurements with laboratory assistant, H. B. Ivy.



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Talk about economy! Alcoa's lightweight aluminum pipe means major savings on your piping for water supply, gas lines, gathering systems, tank battery lines and vent lines.

Light weight cuts hauling, handling, installing costs: Because it's so light, you can haul larger quantities of Alcoa® Aluminum Pipe in every truckload. One man can easily handle standard lengths, and that means small crews can lay long lines quickly and easily. The net result is a big cut in installation costs.

Excellent corrosion resistance eliminates heavy maintenance and replacement costs: Severe operating conditions pose no problem for corrosion-resistant aluminum pipe. And it takes the abuse of being laid or strung from supports over rough terrain.

Cut *your* piping costs with portable piping of safe, non-sparking Alcoa Aluminum. It's available—along with quick couplings of aluminum—through a nationwide network of distributors. You'll find them listed under "Pipe" in the Yellow Pages of your telephone directory. Check your nearest distributor for a complete list of sizes available . . . or mail the convenient coupon.

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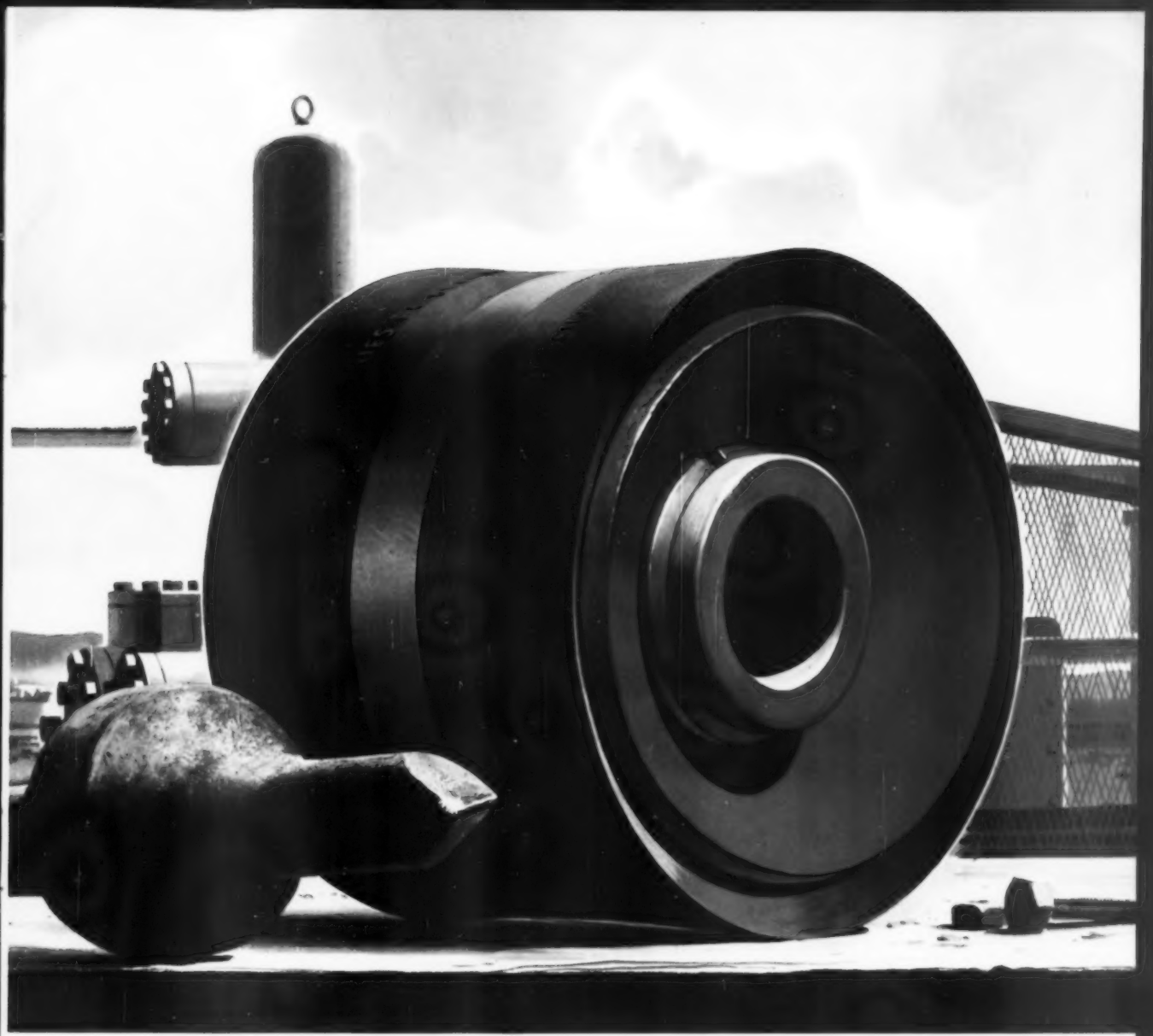
There's a lot more difference in these **MISSION PISTONS** than just ten years!

Although these two Mission Pistons look a lot alike, the 1957 model at the left will give much better service than the 1947 model at the right.

With the 1957 model, you can take advantage of far higher pump pressures than you could when using any other pistons — including Mission Pistons of ten years ago.

Or, if you don't require high pressures, you can get far longer service life than before.

Why? There are many good reasons! In the past ten years for example, *27 improvements*



have been incorporated into Mission Pistons.

Most of these improvements, such as advances in piston rubber compounds, can't be seen, but they mean that today's Mission Pistons are giving excellent service under jet drilling conditions that would have been considered impossible only ten years ago.

In addition to the changes actually made, Mission Engineers have conducted 371 *test pump laboratory and field tests on piston rubbers alone in just the last three years.* That's an average of over 120 tests per year.

This kind of research means lower costs, less down time, better slush pump performance and faster drilling for you. It is an important reason why more Mission Pistons continue to be used than all other makes combined. You can get Mission Pistons and Mission Piston Rubbers through supply stores everywhere.

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Service
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New Services • • • New Tools • • • New Methods • • • Outstanding Results

M-3 Guns Shoot 641 Burrless Bullets in High Angle Well for 151 B/D

This California well had previously been perforated by another service company without results.

Casing was 7" O.D. N-80 cemented in a 12¼" 65° hole. Depth of perforating operation was below 6900'.

4¾" O.D. McCullough M-3 Bullet Perforators fired 641 improved ½" Burrless Bullets in the pay zone for 151 barrels per day of clean oil.

In spite of the high angle of the hole the job was completed without difficulty of any type—a tribute to the efficiency and versatility of McCullough's Perforating Service and the skill of their gun crews.

M-3 Gun Brings in Best Well in Field

Deep Penetrating McCullough M-3 Gun Perforates for 1084 B/D, Cuts Costly Rig Time to Minimum

Deep penetrating power, accuracy and exceptional speed combined to give this New Mexico operator a highly profitable completion.

This was a development well in a proven field. 5½" O.D. 14 lb. casing had been set to total depth.

McCullough logged from 2600' to 3037', obtaining Gamma Ray and Neutron curves and recording a simultaneous collar log. Pay zone was located between 3012' and 3022'. The 10' zone was perforated by a 3½" O.D. McCullough M-3 Bullet Perforator firing 60 improved ½" Ogival Bullets, six per foot. Casing was loaded with oil at the perforating interval.

On production tests the well flowed 1084 barrels of oil per day without fracturing or acidizing—the best well in the field.

By perforating from the accurate measurements of the McCullough Radiation Well Logger, the entire pay zone was uniformly covered by an exact pattern of shots from the M-3 Gun. Since the M-3 fires all shots at one time, the hole pattern in the casing is the same as the chambers in the gun.

Rig time on this job was slashed to a minimum. Only one hour and five minutes was required to complete both logging and perforating—an important saving to the operator.

Speed like this can only be accomplished by experienced, thoroughly trained service crews and by using simultaneous firing M-3 Bullet Guns —fastest, most efficient method of bullet perforating available.

Simultaneous firing of M-3 Guns assures uniform hole pattern in casing.

The perforation pattern in the casing is the same as the chambers of the M-3 Gun itself. Shots are placed in patterns of staggered rows. This permits the safe use of more holes per foot in the casing, assures complete, uniform coverage of the productive zone, provides maximum drainage area and eliminates the possibility of bunching all shots in one area in the casing.

McCullough® *TOOL COMPANY*

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LOS ANGELES
HOUSTON
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Laboratory assistant, Wayne W. Howard, adjusts pressure setting to cylinder control, on variable volume pump. All pumps used on the machine are shown in this photo.

Control console is located on the building floor, just under the pump. Camp is at the controls while B. J. Cope, laboratory assistant, inspects the drill bit.

load on the pistons' downward travel.

A closed center type four-way valve controls the direction of travel.

Rotation System

Power fluid for the rotation is supplied by two pumps, one of which is a cylinder controlled variable volume type of pump. The output of the variable volume pump is directed to a sequence valve which builds up pressure in a primary circuit to the pump cylinder control.

A remotely controlled pressure reducing valve is used in this primary circuit to vary the pump cylinder pressure and control the output volume of the pump. The secondary circuit from the sequence valve passes through a check valve into a four-way valve used as a pump selector valve.

Power fluid from the fixed displacement pump is passed through a check valve and into the pump selector valve. The function of the pump selector valve is to direct power from either one of the two pumps into the motor, and in neutral position, fluid from both pumps is directed to the motor. Fluid from the pump selector valve goes to a second four-way valve which controls the direction of rotation of the motor.

A relief valve is T'd off the fluid supply line, and pressure setting is remotely controlled. This allows the operator to control the maximum output torque of the fluid motor.

Control Console

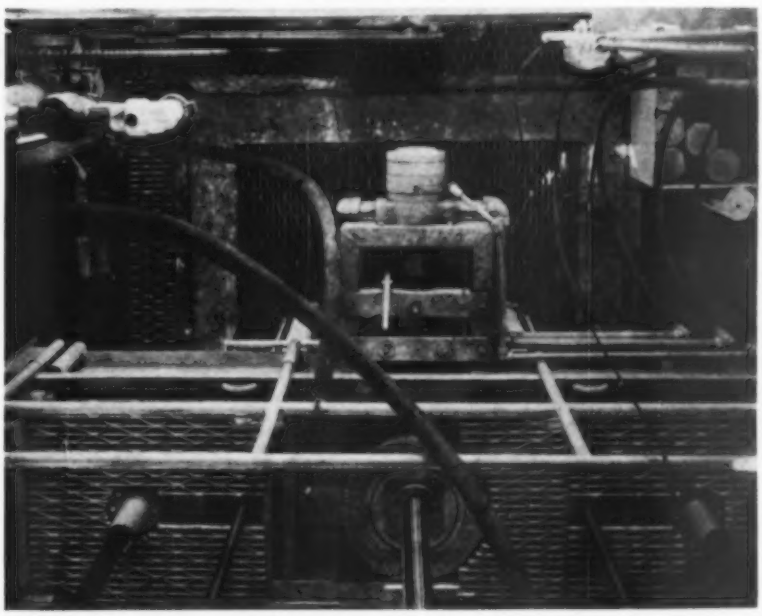
Control console is on the building floor just under the pumping equipment. This console permits the operator to control all functions of the drilling machine. He can adjust rotational speed, force and direction with one set of remote control and four-way valves. A second remote control and four-way valve hookup, permits control of direction of piston travel and amount of force exerted by the cylinders.

This drilling machine is a research tool, but it is capable of handling regular oilfield drilling tools, and testing them to their full capacity. The main difference between this laboratory machine, and a normal field rig is in the far more precise control which is necessary for research studies.

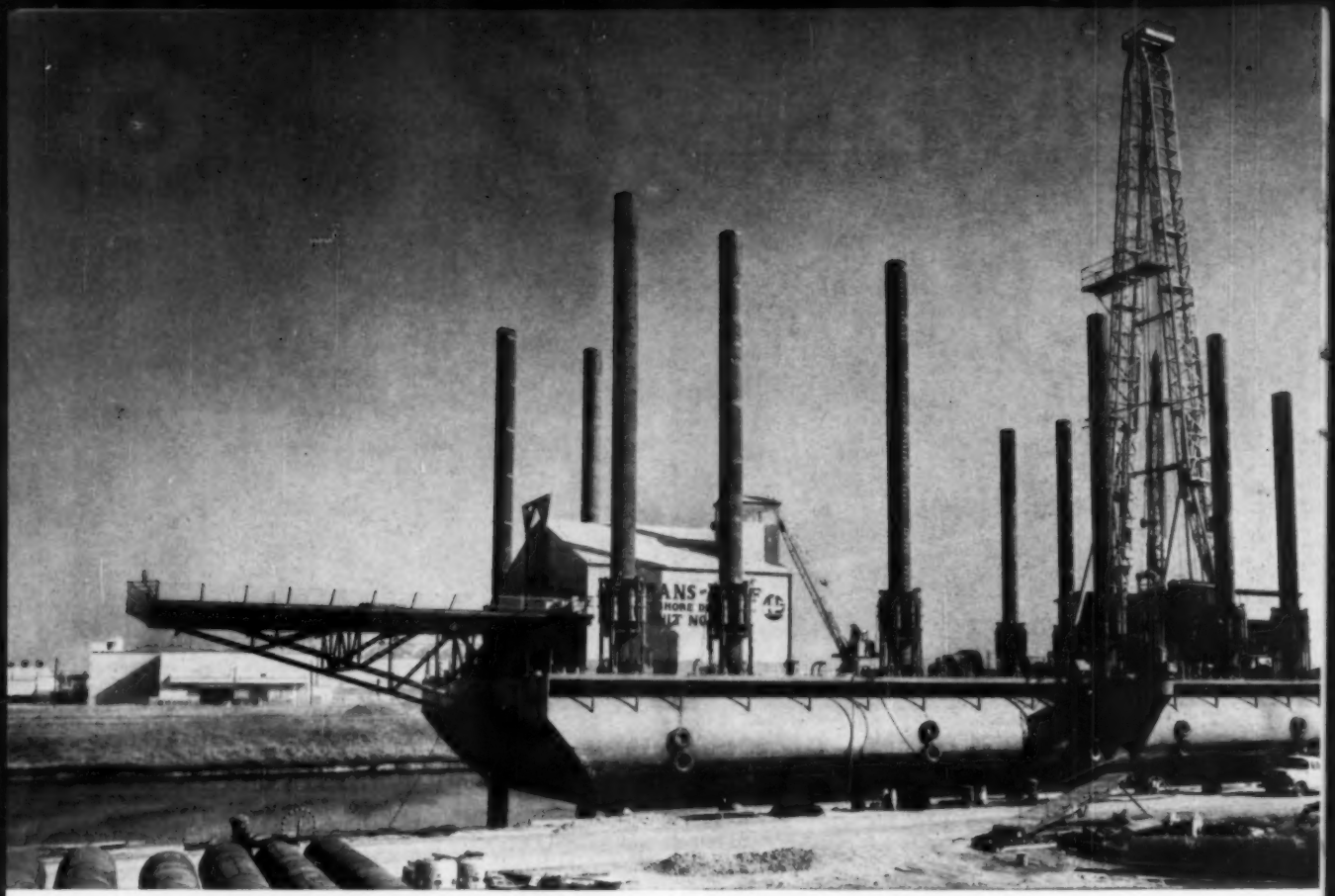
The entire machine was designed and built at the Tulsa lab.

Acknowledgment

The author wishes to acknowledge assistance of engineers from Denison Engineering Division, American Brake Shoe Company, Columbus, Ohio, who cooperated in the construction of the drilling machine. ★ ★ ★

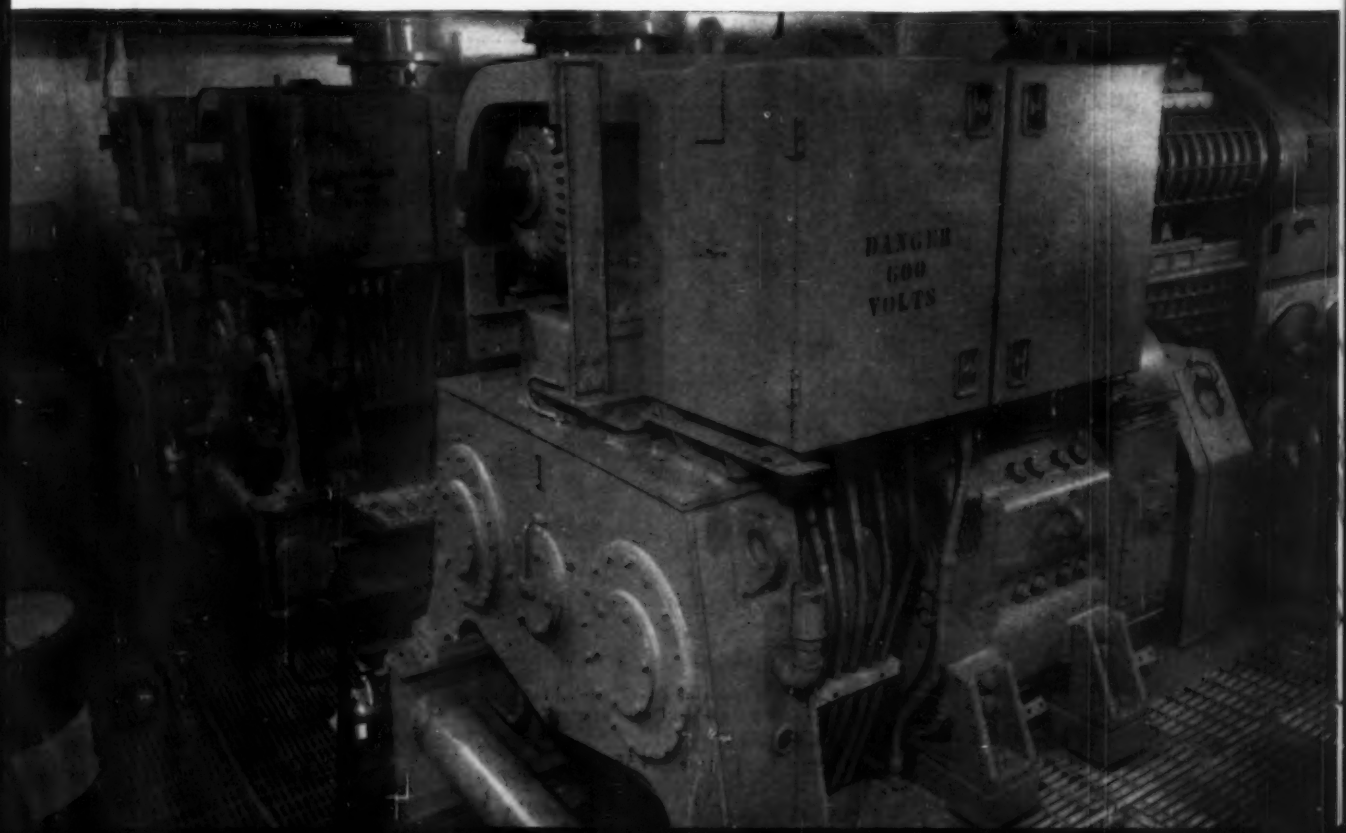


Looking down on direct coupled fluid motor to two speed transmission, in turn direct coupled to the rotary table. Drillstem extends downward from the center of the rotary table.



The huge mast on Trans-Gulf's new mobile rig towers 143 feet above the deck. Hydraulically operated legs, each 210 feet long, permit drilling in 75 feet of water. A two-story crew quarters is located on the bow main deck.

Three Electro-Motive engine generator sets of 1000-hp are located in the hull which leaves the deck clear of power equipment. Mud pumps, each powered by two 625-hp electric drive motors are also located below deck.



TRANS-GULF RIG No. 10 is Electro-Motive Powered

Trans-Gulf No. 10 ranks among the largest rigs in drilling capacity—25,000 feet. Yet, by offshore measurements it is very compact, a design that was accomplished by placing major power equipment in the hull. High cost deck space was held to a minimum without sacrifice of drilling efficiency or accommodations for the crew of forty-two. Deck measures only 87 by 185 feet.

In both control and design, Electro-Motive Power provided cost-saving answers for Trans-Gulf. The standardized components of this power system give complete freedom of equipment arrangement. Standardization also means simplified engineering. You have only *one* manufacturing responsibility for *both* electrical and mechanical components on installation and for service.

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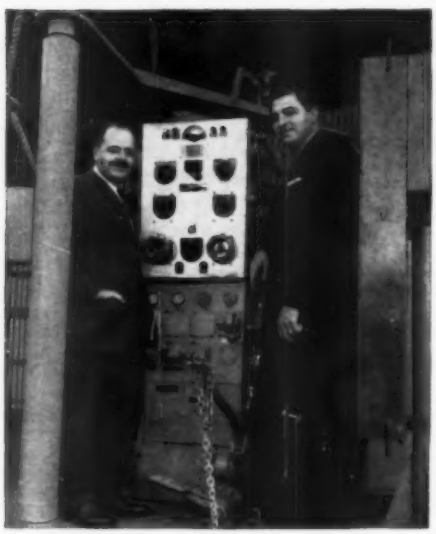

Inspecting the control console at the driller's station is William Flynn, (right), Vice President of Trans-Gulf. With him is Electro-Motive representative Art Hazell.

Two of the three 625-hp electric drive motors for the big 2500-hp IDECO draw works are shown in their mountings underneath the hoist. This unique arrangement conserves valuable deck space.

PESA survey shows oil industry in 1957 spent . . .

$1.175 Billion for Drilling-Producing Equipment and Services

This estimate based on a recent survey over 90 percent complete by Petroleum Equipment Suppliers Association in cooperation with the Department of Commerce. About 18 percent is for services

About $1.175 billion was spent in 1957 by the petroleum industry for drilling and producing equipment and services. This estimate, given by PESA Secretary H. R. Safford, Jr., before the 23rd Annual Meeting, June 28-July 2, 1958 at Chateau Frontenac, Quebec, Canada, is based on returns over 90 percent complete. This industry-wide survey is made once every two years by the Petroleum Equipment Suppliers Association in cooperation with the Business and Defense Services Administration of the U. S. Department of Commerce. Purpose is to collect and compile statistics concerning raw material consumption and dollar value of drilling and producing equipment and services.

What the Survey Showed for 1957 Sales of Drilling and Producing Equipment and Services (90.5 percent complete as of June 9, 1958)

(A) As of June 9, 1958, 412 reports out of a possible 455 have been received; thus these advance figures total 90.5 percent of the total, a very high rate of response.

(B) The 1957 dollar value of products and services for our industry (on the basis of present returns) is $1,132,995,694. This is about 3.22 percent above the total figure of $1,096,599,858 reported for 1955; and approximately 18 percent above the figure of $929,245,866 for 1954.

Present and unofficial estimates are that the final figure for 1957 will probably approximate $1,175,000,000 which would be an increase of 7.3 percent over 1955.

(C) Though the form does not differentiate between goods and services, unofficial estimates made in 1955 indicated that approximately 18 percent of the total comprised services. Using this percentage factor against the figures as of June 9, 1958, a total of $203,939,224 was spent for services as against $929,056,470 for goods. These two figures compare with $199,733,067 for services, and $896,866,791 for goods in 1955.

Four Areas Predominate

(D) Of the dollar volume reported as of June 9, 1958, 66.7 percent of the total was the result of the operations of firms located in four definite areas: Houston, Los Angeles, Tulsa, and Dallas-Fort Worth. In 1955, these four areas accounted for 68 percent of the total, and in 1954, 61.9 percent of the total. The dollar volume figures are: 1957 (incomplete) - $755,648,873; 1955 - $745,562,462; and 1954 - $575,063,908.

Comparing each of these four areas individually with the other three, shows the following:

(1) HOUSTON AREA

	1957	1955	1954
Dollar Volume	$427,560,515	$387,837,887	$316,499,292
Percent of Total	37.7%	35.4%	34.1%

(2) LOS ANGELES AREA

	1957	1955	1954
Dollar Volume	$168,021,474	$151,762,177	$104,554,419
Percent of Total	14.8%	13.8%	11.3%

(3) TULSA AREA

	1957	1955	1954
Dollar Volume	$ 94,804,979	$122,541,941	$ 97,322,432
Percent of Total	8.4%	11.2%	10.5

(4) DALLAS - FORT WORTH AREA

	1957	1955	1954
Dollar Volume	$ 65,261,905	$ 83,420,457	$ 56,687,765
Percent of Total	5.8%	7.6%	6.0%

(E) On controlled materials usage, the incomplete returns have not yet been broken down into the various categories that were reported for 1955 and 1954. (This will be done when final and official figures are reported.) However, certain comparisons can be made at this time on the basis of the incomplete figures.

In the following tables various materials are listed by code numbers, as follows:

OX—Carbon steel
2X—Alloy steel
3X—Nickel Bearing Stainless
4X—Non-Nickel Bearing Stainless
NA—Nickel Alloys
5X—Copper and Copper Base Alloy (Brass Mill)
6X—Copper Wire Mill Products
7X—Copper and Copper Base Alloy (Foundry Products)
8X—Copper and Copper Base Alloy (Powder Products)
9X—Aluminum

Controlled Materials Usage Comparison by Years.

Material	1957	1955	1954
OX	478,434 Tons	526,190 Tons	478,423 Tons
2X	229,853 Tons	248,294 Tons	204,771 Tons
3X	5,066 (M) lb	9,632 (M) lb	3,215 (M) lb
4X	6,134 (M) lb	2,246 (M) lb	2,158 (M) lb
NA	965 (M) lb	—	—
5X	3,969 (M) lb	4,965 (M) lb	4,034 (M) lb
6X	1,953 (M) lb	1,783 (M) lb	1,226 (M) lb
7X	5,480 (M) lb	5,147 (M) lb	3,866 (M) lb
8X	6 (M) lb	33 (M) lb	95 (M) lb
9X	3,997 (M) lb	5,757 (M) lb	4,462 (M) lb

The total reported steel requirement (OFME and Oil Country) was 3,530,928 tons in 1957, up approximately 9 percent from the 3,211,750 tons reported in 1955. No similar figure is available for 1954. These figures are from the Iron and Steel Division of BDSA (Department of Commerce).

A special PESA task force evolved the statistical form now employed by the government. This same form designed for the oil industry was also adopted as the standard form for all hard goods industries.

Although the final and official figures have not yet been compiled (since there are a few companies whose reports have not as yet been received) the totals to date have been compiled and made available to PESA members. Said Secretary Safford: "It (this survey) is a measure of the cooperation of your Association with the Department of Commerce that these government statistics on our industry are to be officially released here this afternoon through PESA."

It is expected that the final and complete statistics will be available the end of July 1958. ★ ★ ★

Controlled Materials Usage Comparison by Areas.

Material	Houston 1957	Houston 1955	Houston 1954	Los Angeles 1957	Los Angeles 1955	Los Angeles 1954
0X (Short tons)	58,049	63,849	47,596	29,349	41,427	30,866
2X (Short tons)	118,916	118,978	93,989	22,415	27,007	15,969
3X (M) lb	2,448	2,508	944	922	1,298	06
4X (M) lb	3,992	1,540	1,420	289	167	97
NA (M) lb	212	—	—	74	—	—
5X (M) lb	759	811	743	333	304	277
6X (M) lb	241	286	136	34	36	18
7X (M) lb	848	996	863	549	440	184
8X (M) lb	3	17	—	1	10	62
9X (M) lb	800	1,054	641	508	1,526	272

Material	Tulsa 1957	Tulsa 1955	Tulsa 1954	Dallas–Fort Worth 1957	Dallas–Fort Worth 1955	Dallas–Fort Worth 1954
0X (Short tons)	74,512	100,419	80,415	34,728	46,519	17,820
2X (Short tons)	6,065	18,234	5,796	10,922	12,202	16,865
3X (M) lb	221	277	66	678	942	360
4X (M) lb	178	158	91	620	16	207
NA (M) lb	79	—	—	196	—	—
5X (M) lb	139	559	460	226	237	220
6X (M) lb	45	53	54	105	72	39
7X (M) lb	129	165	220	34	38	46
8X (M) lb	—	9	—	12	10	8
9X (M) lb	638	371	783	378	415	351

Comparison of Overall Sales of Drilling and Producing Equipment and Services (including exports) for years 1954, 1955, 1956 and 1957.

Sources—Census Bureau Form FT-410 and BDSA Form 274 (Summaries)

	Total Dollar Volume of Shipments	Total Dollar Volume of Exports	Assumed Total Dollar Volume of Domestic Shipments
1957 (Incomplete)	$1,132,955,694	$236,454,174	$886,501,520
1956	—*	210,129,516	—
1955	1,096,599,858	129,656,494	966,943,364
1954	929,245,866	99,447,714	827,798,152

*No report on BDSA Form 274 for 1956.

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- All working parts (except cast steel body) manufactured from stainless steel.
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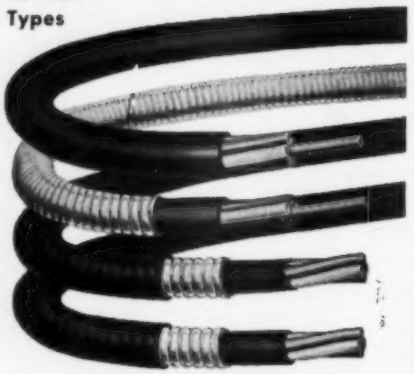

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Crescent Armored Multitube® consists of long-length copper, aluminum or polyethylene tubes twisted together to permit bending without distortion. In each layer, one tube is a bright blue color, affording a fast means of identification from both ends.

Type CT — For damp or corrosive locations where a moderate degree of mechanical protection to the tube is required. It employs a corrosion-resistant thermoplastic sheath, resistant to water, acids, alkalies, oil, and is flame-retardant.

Type CTA — Where maximum mechanical protection is desired during and after installation, such as direct burial in concrete and for pulling into conduit.

Type CAT — For protection against corrosion to the armor and to the tubing.

Type CTAT – Combining the advantages of Types CTA and CAT, the fourth type illustrated has the polyvinyl chloride thermoplastic sheath both under the armor and over the armor, thus providing maximum mechanical and corrosion protection.

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THE OASIS—

A gathering spot for NOMADS

Recent guests of the Houston Chapter of Nomads include: S. P. King, vice president of Tennessee Gas Transmission, Overseas Department, Houston; Francisco Nogueira, Petrobras Brazil, Salvador Bahia, Brazil; Simon Stein, Petrobras Brazil, Salvador Bahia, Brazil; Alan D. Waldie, speaker of the evening, McCollum Exploration Company, Houston; H. Beklik, drilling contractor, Tehran, Iran; Bukley Wright, purchasing agent for Perforaciones Delta, Maracaibo, Venezuela; George Haley, engineer for Beckley, Haltom & Hickman, Amaco, Venezuela, and B. G. Frazier, engineer for International Drilling Company, Rome, Italy. These attended the March 10 meeting.

Speaker of the evening, Joseph Gilliland (center), president of Gilliland Oil Company, at the March 12, 1958 meeting of the Los Angeles Chapter of Nomads. To his right is Earl Daniels of Hydril Company, president of the chapter, and to his left Pop Atkins of Devex Engineering Company, vice president. Standing, Tom Ashe of Globe Oil Tools, program chairman.

New York chapter of Nomads had a large number of visitors at its March meeting at the Hotel Roosevelt. They were: W. R. Patton, Petroleum Machinery Corporation, Venezuela; R. W. Edwards, Esso Petroleum Company, London, England; E. Vermast, Nenimy, N.V., The Hague; Dr. E. Van Vugt, Nenimy, The Hague; W. K. Burley, Davey, Paxman & Company, England; E. E. Dawson, Esso Standard, Turkey; (standing) Mack Bowman, Petromac; J. T. Stewart, American Overseas enroute to Libya; G. L. Dean, Standard-Vacuum Oil Company; J. Cove, Davey, Paxman & Company, England; F. Abbott, Arabian American Oil Company; Jack C. Norton, Oil Center Tool Company, member Houston chapter.

New members of the Los Angeles Chapter of Nomads inducted at the June 11, 1958, meeting are shown standing between Earle Atkins of Devex Engineering Company, vice president and Ritual Master (left) and F. J. Olson of Southwestern Engineering Company. They are (left to right) C. William Zublin of Sales & Engineering Associates, Regular Member; John V. Pennington of Globe Oil Tools Company, Regular Member; and William L. Brannon of Hydril Company, Associate Member.

Airborne watchdog is Chili Sutton of Oil Well Manufacturing Company in his jet-powered, pinwheel helicopter ready to take off and fly over the Lakewood Golf Course to protect the innocent in the Los Angeles Chapter of Nomads Whing Ding Golf Tournament, July 18. Valuable prizes are at stake and he will stand for no monkey business. (Photo of helicopter courtesy of Rotor-Craft Corporation.)

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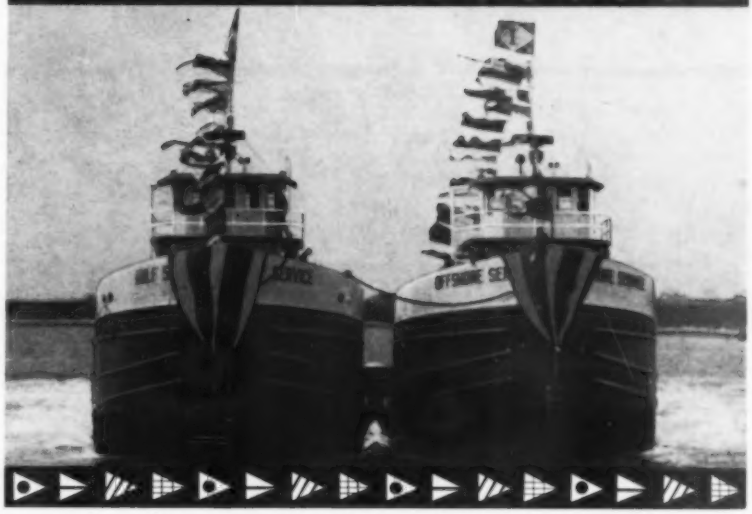

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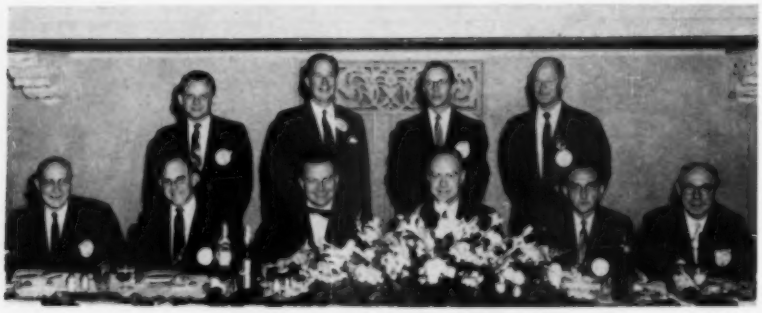
Dependable supply lines are essential to efficient offshore drilling operations. That is why so many offshore contractors, from Houston to Maracaibo, rely on Ingalls-built tenders and supply ships.

Experience gained in working closely with the oil industry since the early days of exploration in the Gulf may be very helpful in planning additions to your fleet.

the INGALLS SHIPBUILDING CORPORATION

EXECUTIVE OFFICES: Birmingham, Alabama
SHIPYARDS: Pascagoula, Mississippi (2 yards)

Guest speaker and international guests at the June 11, 1958, meeting of the Los Angeles Chapter of Nomads. Left to right: (back row) Mel Cooper of AZ Export from Colombia; M. Margolin of Israel Water Works from Israel; P. K. Ozinga of D & E from Holland; Jan Kneepkens of Shell from Brunei; Roger Laguerre of SCP from Morocco; J. P. Caldwell of Kellogg Overseas from Indonesia; E. W. Delaware of Kellogg Overseas from Indonesia; R. C. Smith of D & E from Arabia; John Sligh of P. & S. from Venezuela; E. M. Mong of I.P.C. from Iraq; (seated) P. D. Formosa of SN Marep from France; Claude Remette of SCP from Morocco; J. N. Blanchard, speaker; Jacques Leys of SN Marep from France; B. F. Weaver of P.Y.S. from Venezuela; (kneeling) M. R. Teague of I.P.C. from Iraq; G. H. Patterson of Aramco from Arabia.



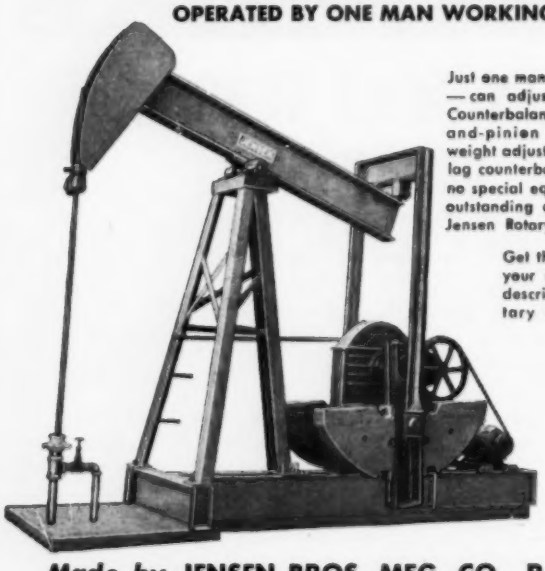
On Thursday evening, May 8, the New York chapter of Nomads held its annual invitation dinner in the Grand Ballroom of the Hotel Roosevelt. There were approximately 260 Nomads and guests available, which number represents one of the largest attendances at an invitation dinner. The chapter was pleased to present as its principal speaker of the evening Mr. Dudley C. Sharp, the Assistant Secretary of the Air Force. Honorary Nomad James A. Clark of the Standard Oil Company of New Jersey served as introductory speaker. Mr. Sharp spoke on various phases of military air developments and his remarks were enthusiastically received by the audience.

Photograph at left shows (seated, left to right) Honorary Nomad Fred C. Sealey, American Overseas Petroleum Ltd.; Junior Regent Maurice F. Delano, Jr., R. S. Stokvis & Sons, Inc.; Vice President Don E. Kircher, Gardner-Denver Company; Dudley C. Sharp; President E. E. Andreason, Andreason-Lundberg Corporation; Honorary Nomad James A. Clark, Standard Oil Company of New Jersey; (standing, left to right) Assistant Sergeant at Arms J. W. Chanda, A. O. Smith Corporation; Assistant Sergeant at Arms D. T. O'Connor; Treasurer W. E. Volkman, Cardwell Manufacturing Company; Senior Regent Herb E. Maland, R. J. Eiche & Associates, Inc.

In photograph below is Dudley C. Sharp, the Assistant Secretary of the Air Force. Also identified is President E. E. Andreason.

The New JENSEN Rotary Balanced JACK offers:

SAFE, EASY RACK-AND-PINION COUNTERBALANCE OPERATED BY ONE MAN WORKING ON THE GROUND



Just one man — standing on the ground — can adjust the new Jensen Rotary Counterbalance. Unique Jensen rack-and-pinion system assures speedy weight adjustments, gives both lead and lag counterbalance. No heavy lifting — no special equipment. Just one of many outstanding advantages of the all-new Jensen Rotary Balanced Pumping Jack.

Get the complete story. Send for your copy of our catalog, fully describing this new Jensen Rotary Series and the famous Beam-Balanced Line.

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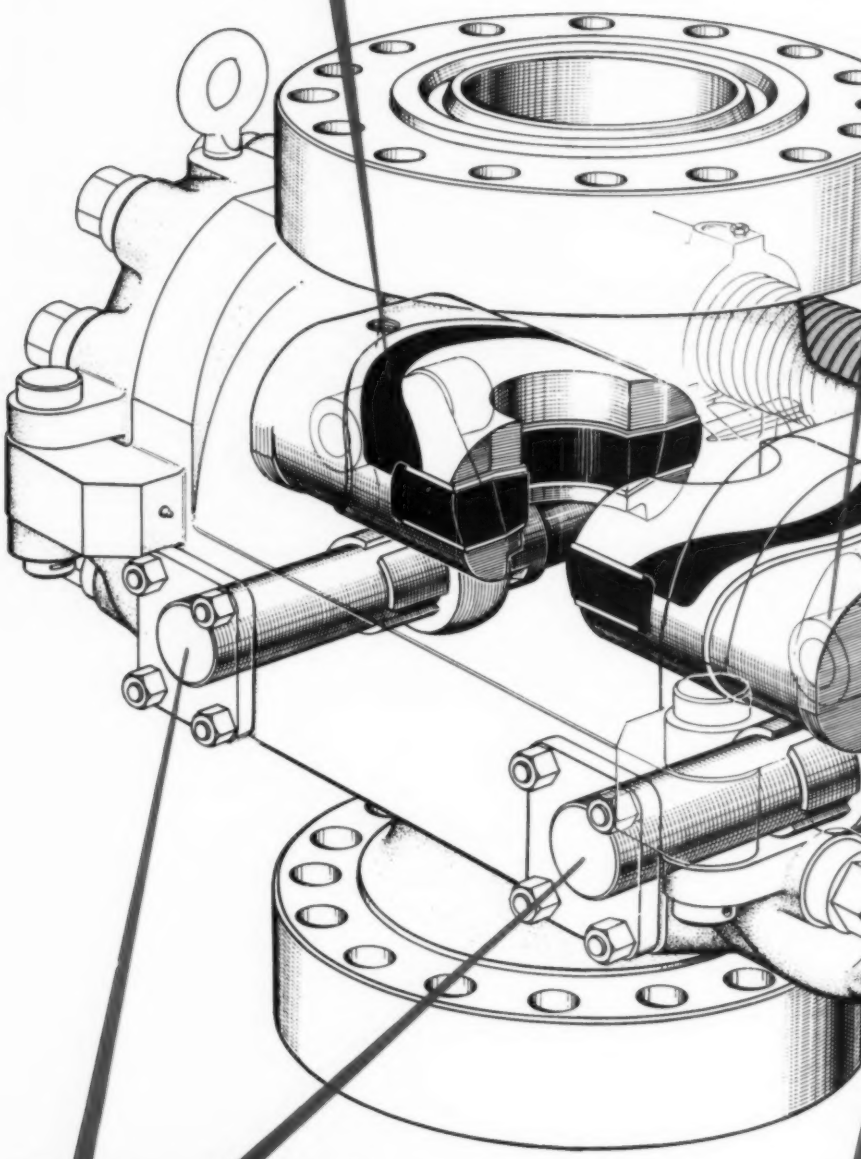
Export Office: 250 Park Avenue, New York 17, N. Y.

JENSEN JACKS

Ram packing is self-sealing and self-feeding, with a big reserve of rough oil-resistant Hycar rubber. These packing elements are built to take the rough treatment they are bound to get.



Transverse ram shafts are pressure sealed at both ends affording "balanced pressure" operation. Shafts rotate—do not pull abrasives into seals as with sliding rods.

Compact hinged bonne
access for simplified r
When fully retracted t
arm assemblies drop
rams. Ram bores are
ward bonnets to ease

Cameron TYPE "F"
BLOWOUT PREVENTER

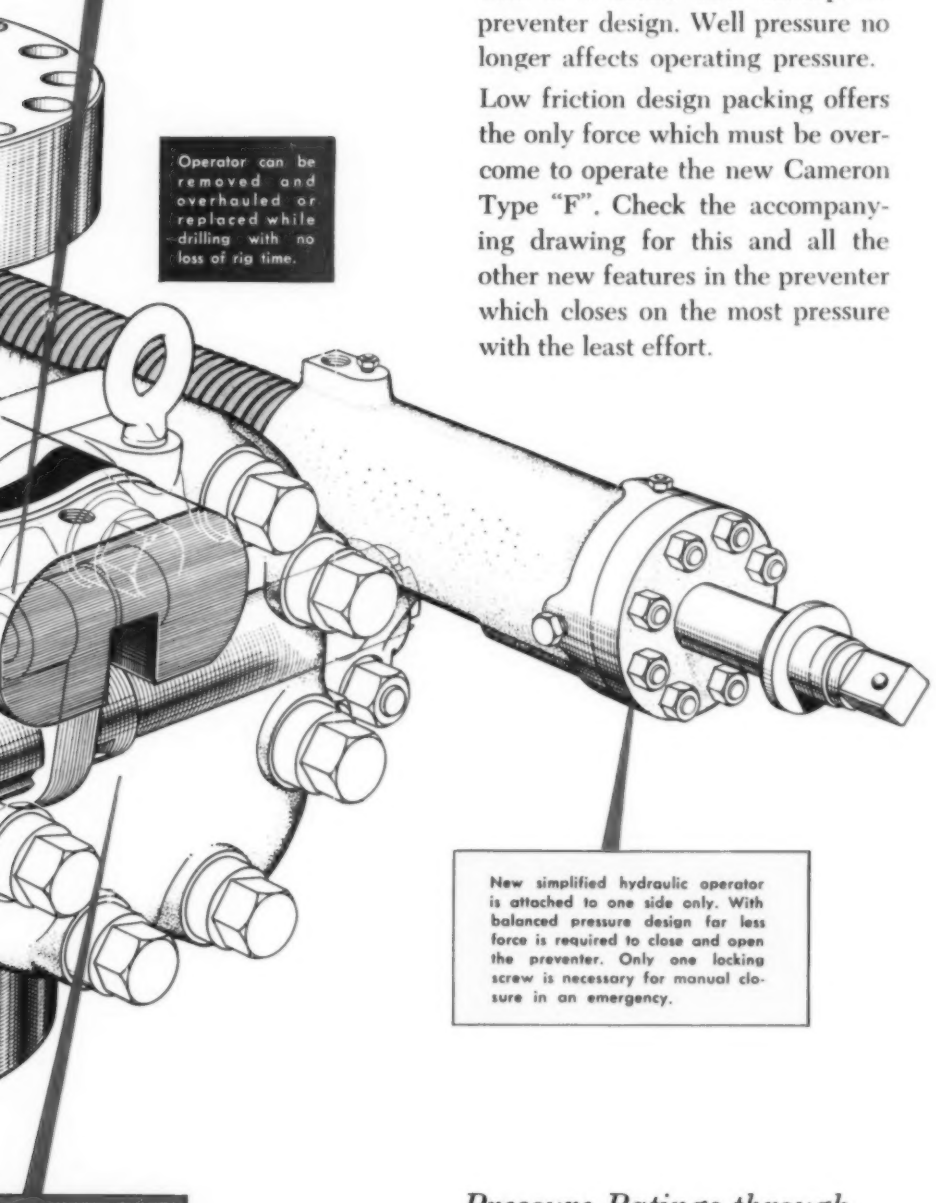
"The Preventer with Pressure Balanced Design"

This is a brand new concept in preventer design. Well pressure no longer affects operating pressure.

Low friction design packing offers the only force which must be overcome to operate the new Cameron Type "F". Check the accompanying drawing for this and all the other new features in the preventer which closes on the most pressure with the least effort.

Arms and rollers operate in Tee slots to close and open rams. Design geometry produces fast movement until rams engage pipe (or each other in blind application), at which point movement speed is reduced and sealing pressure is tremendously increased.

Operator can be removed and overhauled or replaced while drilling with no loss of rig time.



New simplified hydraulic operator is attached to one side only. With balanced pressure design far less force is required to close and open the preventer. Only one locking screw is necessary for manual closure in an emergency.

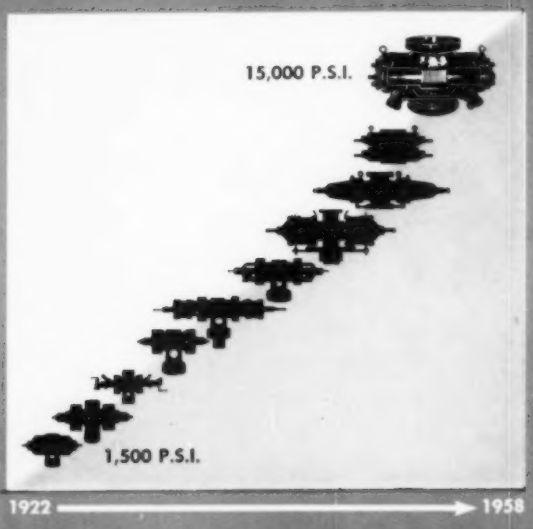
bonnets allow easy
lied ram changing.
cted the roller and
drop free of the
s are relieved to-
ease ram removal.

Pressure Ratings through 15,000 psi W.P.

All models are available with side outlets to eliminate drilling spools.

WELLS GO DEEPER

PRESSURES GO HIGHER



The need for reliable blowout preventers became critical in the early 1920's. Drilling depths had at that time reached gas pressure zones which were increasingly difficult to hold. Available equipment dramatically failed in the field and losses ran high. The first successful blowout preventer, a Cameron design developed during this period, solved the problem and met with instant success. Every Cameron preventer since has anticipated the need for adequate protection and has been ready when higher pressures were encountered. As wells go deeper, pressures increase and equipment to control these pressures becomes a necessity. The Cameron Type "F" Preventer is the latest design in an evolution which has met every new drilling pressure control demand over the years.

Cameron

IRON WORKS, Inc.

P. O. Box 1212 — Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1 England.

RESEARCH NEVER STOPS

New, high range test facilities had to be built for the Type "F" Preventer research and development. Pressure extremes and flow rates not yet encountered in the field are produced under test conditions.

Directions for design improvement and the soundness of new theories are quickly revealed, making this work one of our most important activities. But fact-finding is, of course, only part of the job. Every phase of design development must be coordinated with manufacturing. Designs must be practical in the shop as well as in the field. Here again our facilities are unique. Cameron manufacturing processes are the most advanced in the industry. For instance, we make our own high quality alloy steel. We forge it on huge presses built to our own specifications. Finally, we machine, assemble and test this equipment with all the careful attention a product deserves when it is the finest of its kind.

Cameron

IRON WORKS, Inc.

P. O. Box 1212 — Houston, Texas

Test Project — Dr. Paul B. Crawford (extreme lower left), graduate professor of petroleum engineering at Texas A&M and a member of the Texas Petroleum Research Committee, welcomes Paul E. Weber, sales manager of the Chemical Sales Division, Chas. Pfizer & Company, Inc., and 20 college students who will take part this summer in Pfizer Program 20. The Program 20 representatives will determine the iron content of injection water in flooding operations and demonstrate the utility of citric acid in preventing "iron plugging" and improving flow rates. They are equipped with compact, 30-lb test kits to analyze water right at the well head.

College Men Attack Waterflood Problem

A NEW SUMMER PROJECT designed to show how the results of chemical research can help increase oil production in secondary recovery has gone into full swing throughout the Southwest. The new project—Program 20 — employs the scientific talents of 20 college upperclassmen from top colleges and universities throughout the country. They will spend 10 weeks in the oil fields of Texas, Oklahoma, New Mexico, Arkansas, Louisiana, and Mississippi, testing injection water used in flooding operations and demonstrating how citric acid can reduce "iron plugging" of the producing sands.

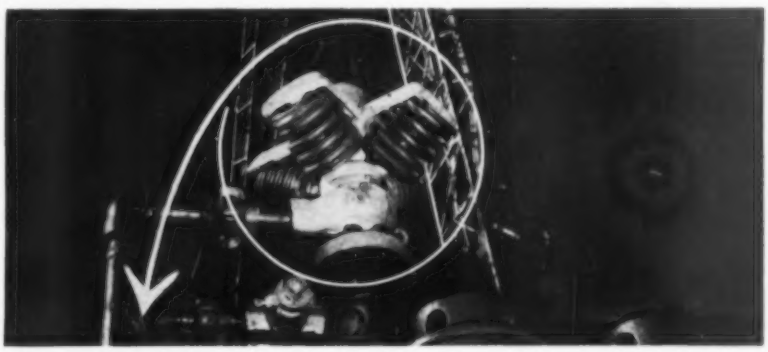
The 20 chemistry and chemical engineering majors were recruited by Chas. Pfizer & Company, Inc., New York drug and chemical manufacturer. Their college instruction has been supplemented at Program 20 headquarters in Dallas by intensive laboratory and field training in the application of organic chemicals in secondary recovery operations.

The Program 20 representatives will perform the water analysis with a compact portable test kit. After determining the iron content of the injection water, they will show how citric acid preferentially sequesters the iron salts that tend to clog the sandface by forming stable, water-soluble complexes with them.

The increased flow rate of water treated with citric acid will be demonstrated by means of membrane filter discs, whose porosity closely resembles the actual sandface.

One major oil company, according to Pfizer, has reported that the addition of 10 parts of citric acid to a million parts of water boosted secondary oil recovery by 15 percent at an additional cost of only one-tenth of a cent per barrel of water injected.

The field test will yield additional information of considerable value, the company adds. All data will be presented to producers without charge, along with a fact file that includes technical information and research data on the uses of organic chemicals in secondary oil recovery.



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Operate rig circulation systems for maximum effectiveness — in complete safety — with Kinzbach Model 112 Mud Pump Relief Valves installed. You are assured instantaneous relief at set pressure with quick, automatic reset to maintain flow and pressure in partially blocked systems. When system is completely blocked, Kinzbach Pressure Relief Valves give full bypass for safety to pumps and other equipment.

Kinzbach Model 112 Pressure Relief Valve pressure range from 500 psi to 16,500 psi safely meets all drilling requirements including cementing and fracturing jobs. Available in 2" and 3" sizes. Write for complete catalog or see your Composite Catalog.

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Small Dehydration Unit

359 A new dehydration unit which makes possible, economically, dewpoints of −150 F and 5-micron filtration of air, gas, or liquids, has been introduced by Dehydrators, Inc. According to the manufacturer, the units will remove 1 lb of water for as little as 7 cents, where former cost ranged from $2.50 to $3.75. Dehydrators range in size from 2 in. to 8 in. in diameter.

Key to the dehydrator's success in obtaining low dewpoints lies in the compensating cartridge. The water-soluble chemical desiccant in the cartridge is under constant spring compression. As the chemical dissipates on water contact, the spring adjusts toward the point of contact, eliminating voids and fissures. A water level gage permits observation of accumulated water, indicating need to replace the cartridge.

The unit can be applied to the problem of elimination of freezing and corroding in air-operated equipment such as intermitter valves on oil wells, control valves, gas engines, fuel gas on package process units, orifice meters, consumer propane tanks and LACT units. The unit is also valuable for plant air systems, process streams, and for air compressors and air tools. *Dehydrators, Inc.*

Portable pH Meter

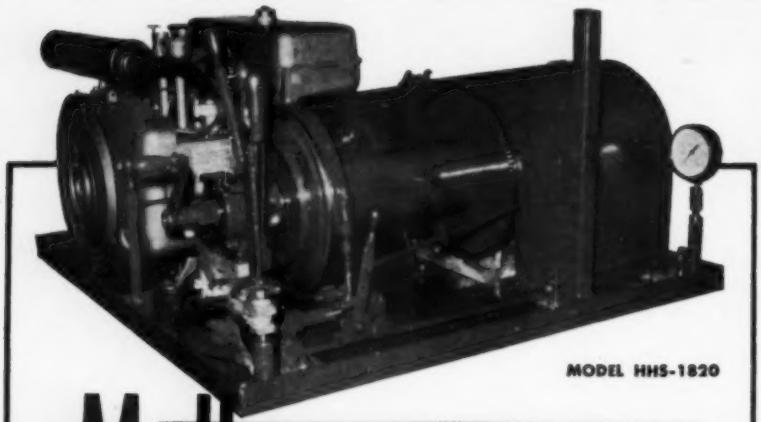
360 Beckman/Scientific Instruments Division has introduced a portable pH meter ideal for pH readings in the laboratory or plant and which may be taken into the field for on-the-spot measurements.

Combination glass and reference electrode allows the operator a free hand to make notations. A range of 2 to 12 pH is possible with readability to 0.1 pH. Instrument is powered by 6 flashlight-type batteries. The meter, weighing 2 lb, is 6 in. long, 3 in. wide, and 2 in. deep. The case is acid-resistant melamine plastic and has a scratch-resistant polystyrene dial face. *Beckman/Scientific Instruments Division.*

Lo-Torque Plug Valves

361 Halliburton's new Lo-Torque plug valve is designed to handle oilfield fluids ranging from cement slurries to acids. The valve operates with minimum difficulty, withstands more pounds of pressure and weighs only 60 lb in the 2-in. size and 40 lb in the 1 in. The valve can be repaired without removing it from the line and, is readily adjusted for correct operating torque.

The valve has a wide range of uses in drilling, mud systems and on Christmas trees. On trucks, the valve is used on discharge and release lines. It is also used on squeeze cementing and testing manifolds and fracturing heads. The multi-purpose valve is most beneficial at high pressures from 10,000 to 15,000 psi. *Halliburton Oil Well Cementing Company.*



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The Oil Industry's First Name in Reeling Equipment
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Mathey's many years of experience guarantee you extra heavy duty construction, precision machining, oversize bearings and forged steel drum flanges. Mathey also engineers and manufactures specialty reels to fit your individual requirements.

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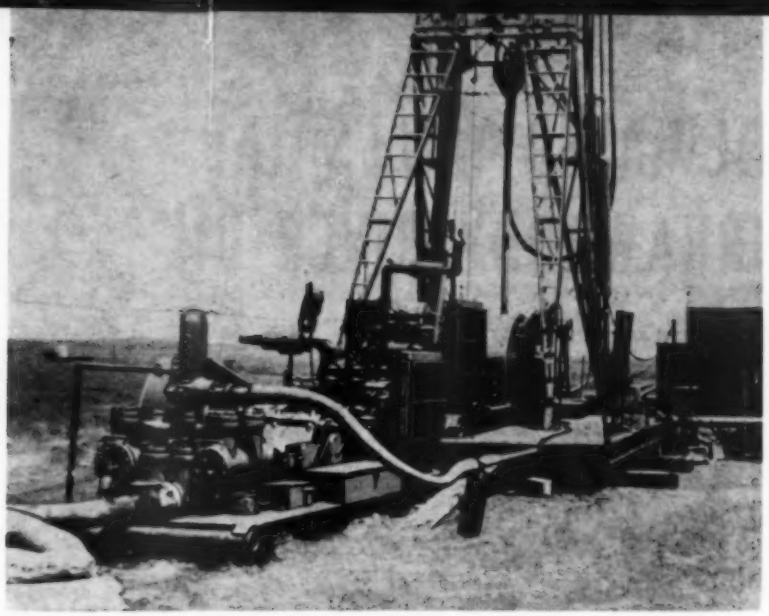

Rex and Morris Drilling Company rig has averaged 8½ days per 3000-ft well for 7 years. Crews need only 3 to 4 hours for setting up, 2½ to 3 hours for dismantling and loading to move to next location. *Courtesy, The National Supply Company*

Light Rig Drills 300 Wells in Seven Years

MORE THAN TWO MILES of hole per month for seven years of continuous operations is the record of Rex and Morris Drilling Company with a comparatively small portable drilling rig in the El Dorado, Kansas, area.

With an average of a little more than 3000 ft per well this rig has drilled 297 wells for a total of 893,258 ft of hole in 82 months of operation. This means more than 3½ wells per month or a well completion every 8½ days for 7 years.

Only three or four brief periods for repairs and other matters have interrupted the continuous operating schedule. Replacement of the drum bearings, hoisting clutch, and flanges were made after 678,000 ft of hole. Drive shaft bearings were replaced after drilling 692,000 ft and one crank bearing on the pump has been replaced.

Drilling is with a 250-hp rig, equipped with a 17½-in. by 44-in. rotary table, a 7¼-in. by 12-in. mud pump, and a 150-ton swivel. The drill string is 4½-in. OD, 16.60 lb per ft pipe. The first drill string drilled a total footage of 273,000 ft of hole. The fifth string of pipe is now in use. Rig and mud pump are powered by diesel engines.

A well coordinated system of dismantling, loading, transporting, and setting up the rig that was developed by Rex & Morris might be compared with that of a circus for moving from place to place. Most of the three four-man crews have been with the rig from the beginning and have improved handling efficiency during the years of operation. Company owned trucks are used for transportation.

When a well is finished the rig can be disassembled and loaded in 2½ to 3 hours. It can be set up and be drilling in a new location in 3 to 4 hours after arrival. For long moves all equipment is loaded on 7 trucks. On short moves, equipment such as water tanks, water lines, and other material not needed to finish a well can be moved to the next location and set up ready for use before the rig arrives.

Considerable planning is necessary for this method of operation. All locations are plotted several days ahead and all legal work is cleared in time for equipment to move on location. All communication is done by telephone, letter or personal contact.

The rig has made several long moves during the past year (up to 140 miles) and many of the wells were cored and tested. During the year 30 wells averaging 3732 ft in depth were drilled. In the first year of operation all wells drilled were either lease or relatively short moves and very little coring and testing was done. As a result the rig drilled 65 wells averaging a little more than 2700 ft per hole.

Acknowledgment

The editors are grateful to The National Supply Company who supplied the information and photograph describing performance of the T-25 drilling rig. ★ ★ ★

Maps ??

Maps and Map Information On All Areas

ALLSTATE map makers

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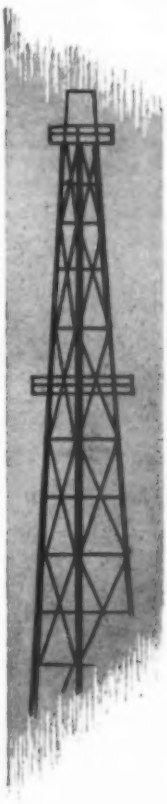


DEVIATED WELLS TAP IRRAWADDY RIVER OIL

Burmese drillers carry out project unaided; drill out from under guide wall, complete first well 675 ft from vertical — 65 ft from target at sub-surface depth of 2092 ft

FOR 16 YEARS oil has been known to exist beneath the waters of the Irrawaddy River between Chauk and Kanya, in Burma, where the river is about a mile in width.

Before 1942, after geologists had confirmed the existance of oil under the river bed, the Indo-Burma Petroleum Company built the Lanywa retaining wall on the west side of the river and drilled successfully for oil in the reclaimed area. The BOC (formerly Burmah Oil Company) then built the Singu, or what is known as the Singu Guide Wall, and reclaimed 83 acres on the east side of the river; here again drilling operations were successful.

To develop the oil resources which lay under the river and between the two walls, a number of inclined wells were drilled by the IBPC from surface positions on the Lanywa wall. In some cases wells inclined at an angle of 43 deg from vertical were drilled in order to reach the producing formations under the river. No inclined wells were drilled from the Chauk side since IBPC held the concession.

Now that Chauk and Lanywa fields are under control of The BOC (1954) Ltd., it was decided to drill deviated wells on the Chauk side, thus doing away with the need to transport men and materials across the river.

Well No. 961

The first well on the Chauk side to tap oil hidden beneath the Irrawaddy is No. 961, which was recently completed by The BOC Ltd. In view of difficulties anticipated and since none of the staff concerned had experience in directional drilling, the possibility of obtaining the services of outside experts was considered. It was eventually decided, however, to make the attempt with the company's own resources.

Before drilling was begun it was estimated that it would take about eight weeks to reach a depth of 2092 ft below ground level. It actually took only four weeks to reach that depth.

The bottom of the well was inclined 675 ft from the vertical and was completed at a distance of 65 ft from the planned objective.

Well No. 961, now completed as a producer, has warranted further development of oil formations under the bed of the Irrawaddy, and has proved that it could be achieved without difficulty from the Singu Guide Wall.

Acknowledgment

The editors wish to thank *Yadana*, house journal of The BOC in Burma, for permission to reprint this report.

★ ★ ★

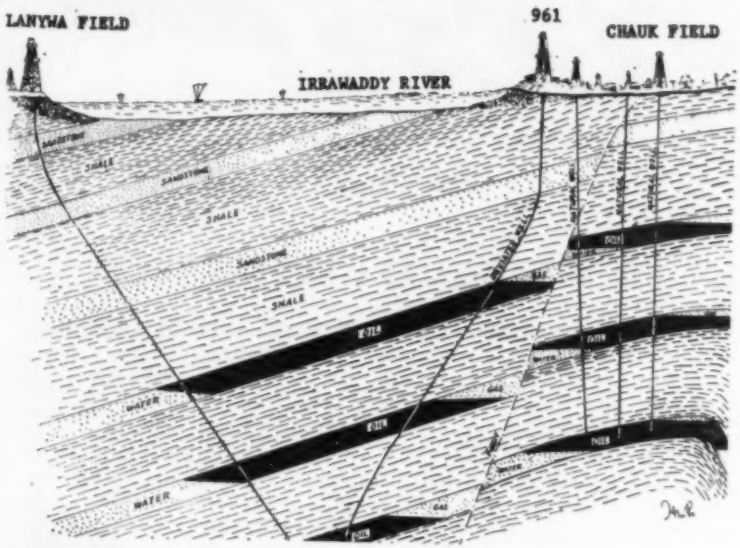
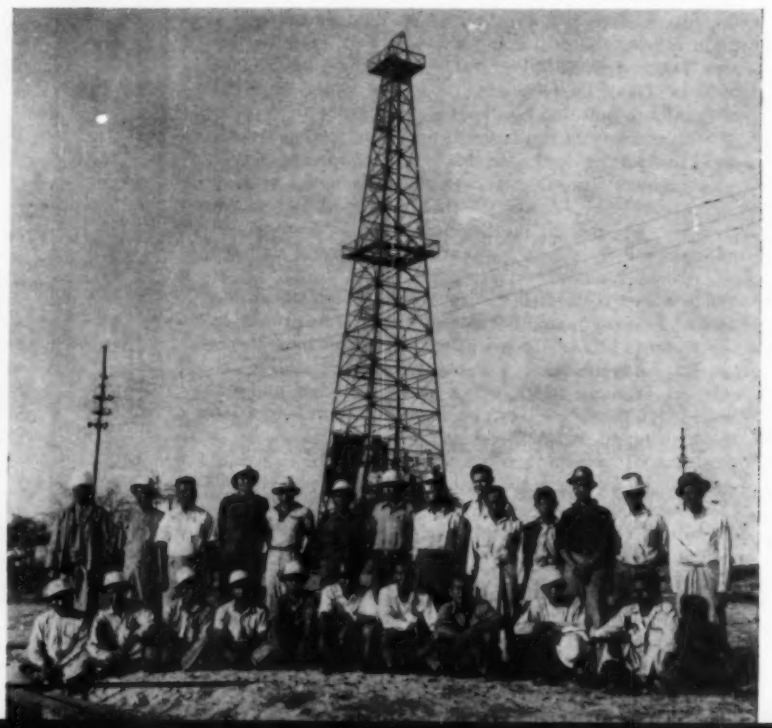


FIG. 1. **Direction wells** tap oil beneath Burma's mile-wide Irrawaddy River. Before the present deviated well program, oil companies reclaimed river bed land and drilled vertical wells to productive formations.

FIG. 2. **Drilling crews** who drilled BOC's Well No. 961. Senior drillers, standing on the left end, are U Shwe Ya, U Ba Sein and U Ba Yin.



Redwood Bark Lost Circulation Material

362 Introduction of 100 percent redwood bark fiber as the exclusive ingredient in Palco Seal drilling mud loss circulation material has been announced by The Pacific Lumber Company. The combination of large and small fibers forms a particularly dense matted barrier in a wide range of porous and thief formations. The material displays virtually complete resistance to any form of deterioration and fermentation. Redwood bark remains loose and workable in the bag due to the springy characteristics of the fiber. *The Pacific Lumber Company.*

Jet Strainer for Waterflood Service

363 A jet type strainer, manufactured by Thornhill-Craver is designed to remove solids, algae, and bacteria from flood water to any desired degree down to sub-micron particle size. The strainer employs a stainless Dutch twill screen, as fine as 400-mesh, spot welded to a monel basket. With a diatomaceous earth precoat, this screen will remove solids down to particle sizes of 1 micron, or less, as well as bacteria and algae.

A pressure-differential gage indicates when the strainer needs cleaning. The basket is jetted clean by means of hydraulic impact. Or, the cleaning operation may be made automatic with electronic controls. Strainers are made in 300, 600, 900 gal per min sizes. *Thornhill-Craver Company.*

Tension-Impact Machine Tests Tool Joint Connections

364 Hughes Tool Company engineers have completed a series of over 200 tension-impact tests in which full-size drillstem specimens were subjected to axial shock loads of over 400,000 ft-lb. After exploring various ways to produce the desired impact load, it was decided that the gravity drop method would best simulate oilfield conditions and provide the high velocity impact required. Hughes engineers designed and built the test equipment.

A shallow well was drilled on plant property and cased. A striking block was designed, consisting of a 4-ton steel base, load transducer and steel anvil holder, bolted together and mounted in a concrete foundation over the hole. Drillstem specimens used in the tests consisted of a joint of drill pipe with tool joints flashwelded at either end. Drill collars were attached to the pipe to give necessary weight. For each drop, pipe and drill collars were raised in the derrick to a height of 28 ft and released. Free-falling specimens were caught on the elevator shoulder of the top tool joint and stopped immediately. In over 200 tests of different assemblies, no failures occurred in the weld or weld area that had been subjected to the heat treating process. *Hughes Tool Company.*

Long Radius Swivel Joint

365 A new line of extra high-pressure Chiksan swivel joints, rated at 15,000 psi test, has been developed to extend the life expectancy of swivel joints carrying abrasive materials. Features which make the "Long Sweep" superior to previous designs include the long radius of the joint which permits a smooth, well directed flow of fluids with a minimum of cavitation. The joint is made from a forged alloy steel and is heat-treated to improve wearing surfaces.

Packing in the joint is of new design which insures satisfactory operation under the dual requirements of both positive and negative pressures. Packing cannot be sucked into the stream regardless of the velocity of the flowing medium. The swivel joint, available in the 2-in. size and in most of the 8 basic Chiksan swivel joint styles, has been designed primarily for use in cementing and fracturing operations. API line pipe thread end connections are used. *Chiksan Company.*

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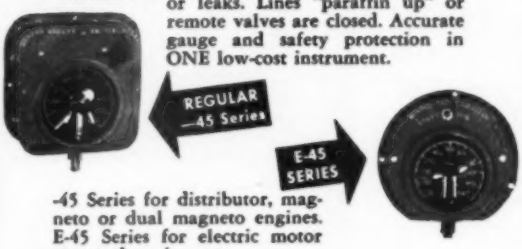

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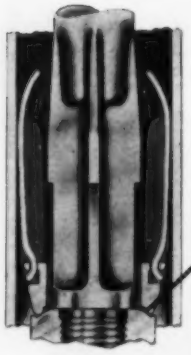
Note adequate flow through passage.

✻ Unrestrained tops . . . respond to lightest or heaviest loads



✻ Positive valving with each cup

Cup in closed position showing rubber impinged seal.

✻ No ball and seat to wear

Sold through Supply Stores Everywhere

Oil States

OIL STATES RUBBER CO.
Arlington, Texas

Electric Utility Units

366 A new series of all-electric utility units manufactured and distributed by Stewart & Stevenson Services eliminates many service difficulties associated with mechanically-driven units. Model 20 DA utility unit is self-contained and consists of an engine driven 20-kw lighting generator, a centrifugal water pump, air compressor and, if needed, a built-in electric welder. The 20-kw generator, which can be provided in either a-c or d-c, is directly connected to the engine and supplies current for operation of the electric motors that drive the component accessories.

Accessories are individually driven by splashproof, ball bearing electric motors of standard make. Speed of components such as the centrifugal pump can be varied without changing engine speed, or interfering with the lighting operation. Units are skid-mounted for portability and are protected from the elements by a light weight sheet metal enclosure with removable side panels for access to the working parts. *Stewart & Stevenson Services, Inc.*

Heavy-Duty V-Belt

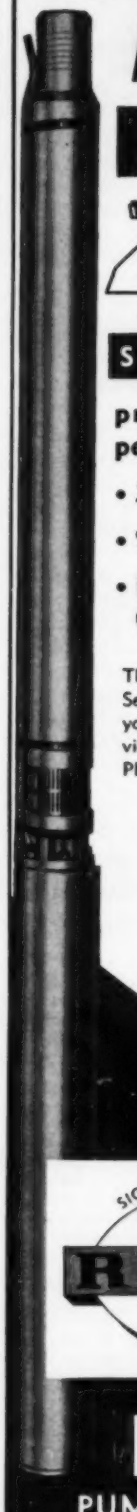
367 A new V-Belt construction has been announced by Raybestos-Manhattan, Inc. The belt features a proportioned construction to eliminate V-belt whip and similar causes of belt turnover. Redesigned belt compression area and repositioned strength members give the belt a degree of lateral and longitudinal stability never before possible with long center rig drives. High tensile, synthetic fabrics are used in the construction of the belt which is preformed before vulcanization to preserve the balance of the component parts of the belt's internal structure. *Manhattan Rubber Division of Raybestos-Manhattan, Inc.*

API Thread Compounds

368 In addition to the products of its own development, Jet-Lube, Inc., manufacturers the two API high-pressure thread compounds, "Silcone" type and "Modified" type. These compounds for casing and tubing threads were developed by the Mellon Institute of Industrial Research under an API-sponsored research project.

The manufacturer is listed in API Bul 5A2 as a manufacturer of API high-pressure thread compounds and has agreed that the manufacture will be in accordance with the stipulations given in that bulletin. Thread compounds are available in 25-lb and 50-lb containers. *Jet-Lube, Inc.*

The NEW REDA "450" SERIES PUMPS



provide more oil per dollar invested

- **250-600 B.P.D.**
- **900-4,400 Ft. Lift**
- **For 5½" or larger Casing Sizes**

The new REDA "450" Series Pumps will REDUCE your lifting costs, and provide ECONOMICAL, DEPENDABLE performance.

- **LOW INITIAL COST**
- **AUTOMATIC OPERATION**
- **LOW OPERATING COST**
- **LOW MAINTENANCE REQUIRED**
- **CORROSION-RESISTANT CONSTRUCTION**

WRITE TODAY FOR REDA R-450 BULLETIN!

LARGER PUMP SIZES AVAILABLE

SIGN OF QUALITY
OILWELL
REDA
PUMPS

REDA
PUMP COMPANY
BARTLESVILLE, OKLAHOMA
Manufacturers of Submergible, Electric Motors and Pumps for Over 35 Years

Magnetic Flowmeter For Difficult Liquids

369 Fischer & Porter's new magnetic flowmeter measures the flow rate of "difficult" liquids such as acids and slurries without adverse effects to the meter. Major features are: Manual adjustment for setting any desired flow rate at full scale (the 1-in. meter can be set to handle from 3 to 40 gal per min at full scale; the ½-in. meter as low as one gal per min); unrestricted flow; readings unaffected by velocity profile, density, or viscosity; voltage changes between 90 and 125 v and frequency changes between 55 and 65 cycles have no effect on readings; special piping for long metering runs is not required; flow can be measured in either direction. *Fischer & Porter.*

Wireline Lubricator Union

370 A new union designed for use with wireline lubricators features a socket-type male and female connection that supports the lubricator in a vertical position while the connecting nut is being made up. This eliminates the need for guy wires and removes hazard of the lower end of the lubricator slipping and causing damage to equipment or injury to men.

An O-ring placed in a groove on the bevelled end of the male piece seats and seals on an identical bevel in the female socket. The nut and female end are supplied with spanner wrench holes to facilitate make-up. The union is furnished in any combination of 2 in., 2½ in., and 3 in. line pipe and EUE threaded ends. *Yale Machine Works.*

Standardized Meter Tubes

371 Daniel Orifice Fitting Company has announced the standardization of meter tubes. Formerly custom items, meter tubes can be ordered as standardized components of oil and gas flow-measurment systems. Meter tube lengths are based on AGA specification and will meet AGA-ASME requirements.

Upstream tube can be removed for periodic inspection and cleaning. Standard dimensions permit units of the same line size and pressure rating to be interchanged without disturbing the initial piping. Tubes are available in sizes from 2 to 6 in., with pressure ratings of 150, 300, and 600 psi ASA. *Daniel Orifice Fitting Company.*

Teflon Double-Seals Valves

372 A new valve-seating arrangement, employing teflon, that achieves a double seal in valves handling petroleum products ranging from the heaviest viscous fluids to the lightest gases at pressures up to 5000 lb per sq in. has been introduced by W-K-M. Specially designed teflon seat insert is said to double the sealing efficiency of the valves. The first seal occurs when the expanding gate and segment faces of the valve contact the teflon insert. The second seal is made by the gate and segment faces against the metal seat. Teflon inserts are now standard on all oilfield valves through 4 in., rated up to 5000 lb per sq in., and are available for larger size valves. *W-K-M Division, ACF Industries, Inc.*

Elevated Water Cooler

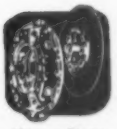
373 H. P. Gott Manufacturing Company has introduced the new Gotkool Tall Boy cooler, which features a "tower base" which provides a higher faucet that has been set approximately 6 in. above the base of the cooler. This enables users to set the cooler on the ground, rig floor or any flat surface without improvising a water cooler stand. The cooler features double-wall thermo construction, sweat-soldered seams, and sturdily soldered faucets. *H. P. Gott Manufacturing Company.*

ROCKFORD

LONG LIFE Heavy-Duty POWER TAKE-OFF

ELIMINATES OUT-BOARD BEARINGS AND COUPLINGS

Small Spring Loaded


Heavy Duty Spring Loaded

Oil or Dry Multiple Disc

Heavy Duty Over Center

Power Take-Offs

Speed Reducers

The heavy-duty construction of ROCKFORD Oil Field type POWER TAKE-OFF bearing assemblies will handle side loads that formerly required the use of out-board bearings—with hangers and flexible couplings. Shaft deflection is no problem with this extra heavy-duty power take-off—when the load is held within specifications. You can reduce the over-all length of the engine and power take-off assembly by specifying ROCKFORD.

BW SEND FOR THIS HANDY BULLETIN Gives dimensions, capacity tables and complete specifications. Suggests typical applications.

ROCKFORD Clutch Division BORG-WARNER

1303 Eighteenth Ave., Rockford, Ill., U.S.A.

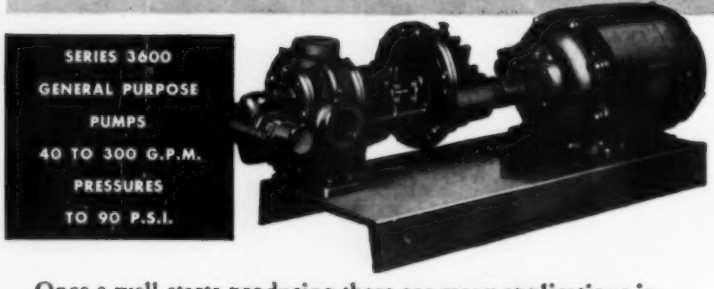
Export Sales Borg-Warner International — 36 So. Wabash, Chicago 3, Ill.

CLUTCHES

Hydraulic Jar Frees Stuck Tools

374 Houston Engineers has introduced the Type T hydraulic jar which operates under severe conditions. The tool is designed so that there is adequate time delay before release, achieved by retarded upper movement of the inner parts. As the piston section of the fluid mandrel passes through the oil sleeve, a high pressure is created above the piston in the fluid cylinder. Fluid slowly bleeds by the close tolerance piston, resulting in a relatively slow movement of the inner parts. As the piston clears the upper end of the oil sleeve, the inner parts rush upward and strike the impact surfaces.

On resetting, a smooth movement takes place. The downward pumping action is thus controllable and without damage to the lower packing. Torque transmitting means and impact surfaces are located outside the closed hydraulic system, assuring that metal chips due to impact cannot foul the working parts in the hydraulic system. *Houston Engineers, Inc.*



Once a well starts producing there are many applications in which a Roper serves best: for gathering line operations . . . tank truck transportation . . . field storage transfer. Ropers are positive displacement pumps (self-priming), and operate on the principle of two equal size gears running in axial hydraulic balance. This simplicity of design provides high pumping efficiency . . . smooth operation to reduce chatter and pulsation . . . and easy servicing right in the field. Packed box or mechanical seal models available. For your specific application, consult the Roper representative in your vicinity.

THE JOB-PROVED PUMPS FOR TRUCK TRANSPORTATION and GATHERING LINE OPERATIONS HANDLING GASOLINE TO HEAVY CRUDE OILS

ROPER HYDRAULICS, INC.
727 Blackhawk Park Avenue
Rockford, Illinois

ROPER
ROTARY PUMPS

Complete Sales and Service in Every Oil Producing Area

Chemical Clarifies Flood Water

375 Fludex WC-4, a water clarifier, has been announced by Tretolite. This new water clarifier improves water quality by breaking oil-in-water emulsions, de-oiling solid particles such as iron sulfide that are oil-wet, and aiding in the flocculation and settling of solids found in brines. It is particularly recommended for use in the treatment of produced brines or mixtures of surface waters combined with produced waters.

WC-4 is composed of both organic and inorganic compounds. It is compatible with chlorine and such conventional water treating chemicals as alum, ferric chloride, and lime. It will not interfere with most organic corrosion inhibitors. *Tretolite Company.*

Pressure Liquid Filters

376 Bag type pressure liquid filters used for filtering amine or glycol solutions are manufactured by Wm. W. Nugent & Company. The filter contains cartridge with component parts fabricated of stainless steel for MEA and DEA solutions, offering maximum resistance to the corrosive action of the liquid. The filter bags are of close, evenly woven, acid-resisting textile material. The filters will remove foreign particles as small as 0.0017 in. In gas processing plants, filters remove iron sulfide formed by the scrubbing operation. Heat exchangers and other equipment in the system receive maximum protection from clogging when the filters are used. *Wm. W. Nugent & Company, Inc.*

Simplified Gas Lift Valve

377 Otis Engineering Corporation has marketed a simplified gas lift valve, with only 2 moving parts and no metal moving parts, which can be used for either continuous or intermittent flow without pulling the string. Moving parts are a main valve and a reverse check valve. Both parts are a resilient, special Hycar composition which effects a bubble-tight seal, even with sand-laden fluids.

The valve, identified as the Type C, is built around a full-opening mandrel, and operates completely by casing pressure. When used in intermittent operation, a minimum amount of gas is required to lift the fluid load, and a system can be changed from intermittent to continuous flow by changing the wellhead adjustments. The casing-pressure-operated principle of the valve allows it to be opened or closed at any predetermined casing pressure — regardless of the tubing pressure at the time. *Otis Engineering Corporation.*

the Refining Engineer

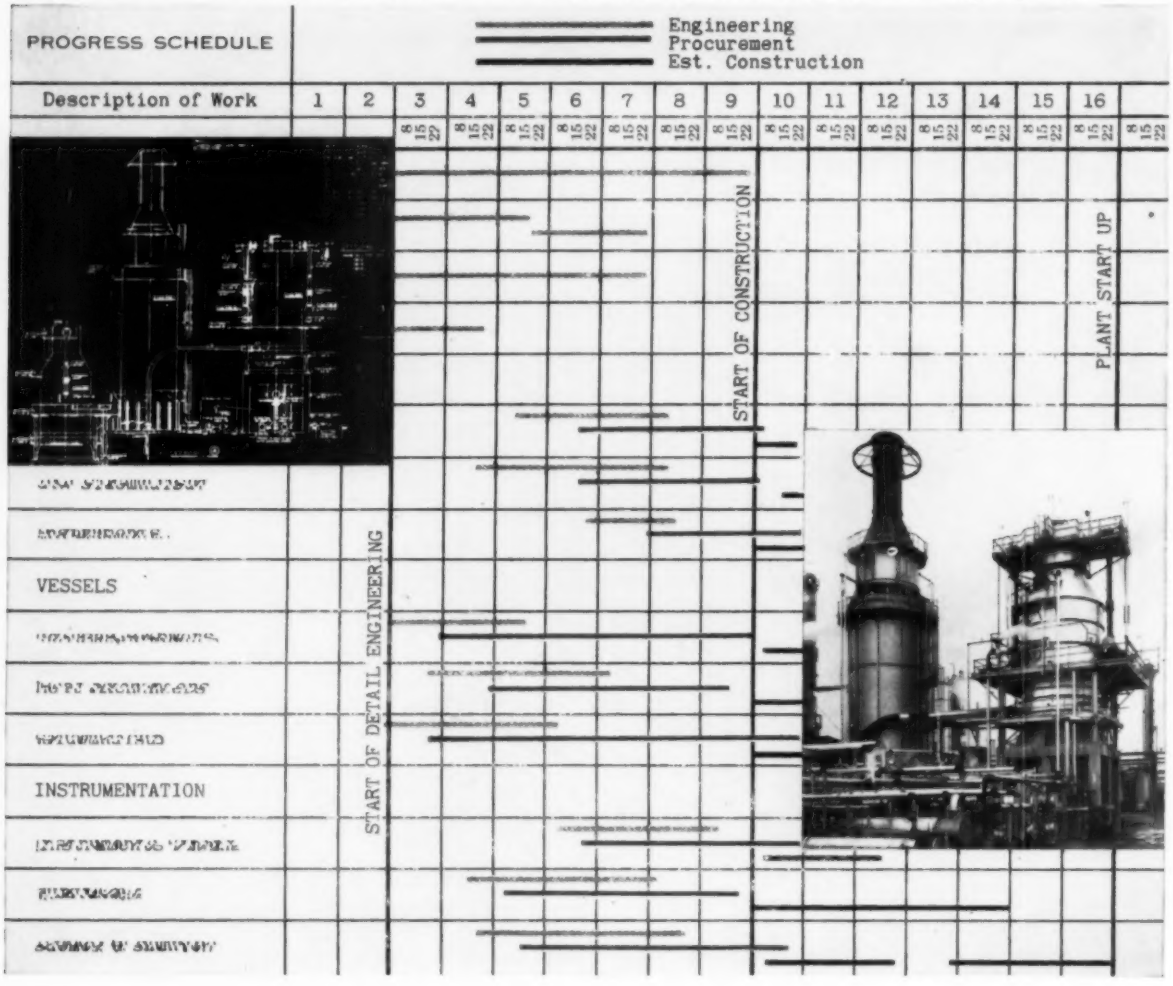
Refining
Petrochemical
Gas Processing

BUILT & SHIPPED... ON TIME

Today, modern oil refineries and chemical plants require more and more complicated pieces of fabricated equipment—too large to ship by rail or road. To meet this need, Sun Ship specializes in building and shipping large carbon or alloy steel units by water (inland, coastal or overseas)... directly from our plant.

SUN SHIP
BUILDING & DRY DOCK CO.
CHESTER, PENNSYLVANIA

Blaw-Knox builds vacuum unit for Ashland Oil.
Located at Canton, Ohio, this unit processes 15,000 barrels a day . . . proficiently reduces carbon content in cat cracker feedstocks . . . boosts overall refinery capacity.



From plans . . . to scheduling . . . to operation integrated construction pays off three times in two years

By placing this vacuum unit on stream on time, Blaw-Knox completes its third project for Ashland Oil and Refining Company. Within the past two years Blaw-Knox has also engineered and constructed two catalytic reforming and hydrogen desulfurization units for this expanding company. Each of these units was producing at capacity, on schedule, and within the budget requirements.

Blaw-Knox prizes its repeated association with many of the country's leading processing companies. For repeat business demonstrates as no other way can, the continuing endorsement of the technical background and engineering skill of this contract management organization.

Bulletin 2547 provides a graphic description of the erection, expansion, and modernization services for petroleum processing plants. For your copy, contact Blaw-Knox Company, Chemical Plants Division with headquarters in Pittsburgh. Branch offices in New York, Chicago, Haddon Heights, N. J., Birmingham, Washington, D. C., and San Francisco.

for plants of distinction . . .

BLAW-KNOX

BUILDING & DRY DOCK CO.
CHESTER, PENNSYLVANIA

Stainless-Lined . . .

TO ARREST HIGH-TEMPERATURE CORROSION

Among the many spherical structures Graver has fabricated in its hundred year history, these reactors for Socony Mobile Oil Company's refinery at East Chicago, Indiana, are typical of the craftsmanship required to assure long, trouble-free life under sustained high temperature and high pressure. To minimize corrosion at operating temperatures of 980° and 600 psi, Type 321 stainless was used for the inner liners, catalyst supports, inlet vapor distributors and drain scoops. The shells were made from 1¾" A201 Grade B firebox quality carbon steel to which an intermediate lining of concrete was applied. Graver's skills in working with all types of alloys assure long life for processing equipment that must operate continuously under high temperatures and high pressures.

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For better, longer-lasting protection—paint it with

Humble's protective coatings

In refineries and chemical plants where strong acids, alkalis and salt sprays produce severe corrosive conditions, Humble's protective coatings can save you hundreds of dollars in corrosion damage. Humble's protective coatings contain rust-preventing ingredients that not only provide surface protection, but also neutralize any corrosive substances that may get through the surface protection and attack the metal. And they give excellent resistance to weathering, plus good color and gloss retention.

Originally developed to protect Humble equipment, Humble's protective coatings have proved their value through years of extensive use, and are now marketed the world over. Included in Humble's complete line of protective coatings are RUST-BAN®, vinyls, epoxies, phenolics, enamels and others. These coatings are available in a wide range of finish colors.

Without cost or obligation, one of Humble's trained engineers will make a thorough study of your needs and recommend a complete painting program for you.

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Houston 1, Texas

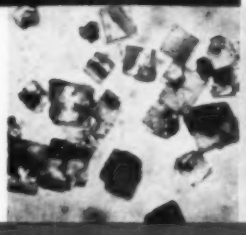
HUMBLE OIL & REFINING COMPANY HUMBLE

FIRST *choice as chemical* AIDS *for these*

REFINERY PROBLEMS

TRETOLITE PRODUCTS

SALT

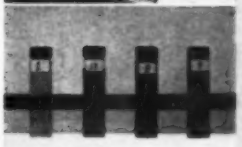


TRETOLITE* DESALTING. Performs in the 98% to 100% salt removal range. Prevents salts, solids, trace metals, other impurities from entering refinery stream; prevents salt plugging, fouling in condensers, exchangers, towers; reduces clean-outs.

CORROSION

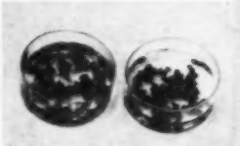
KONTOL* CORROSION INHIBITORS. Prevent internal corrosion, hydrogen blistering; help eliminate scaling, fouling. Adsorb to metal surfaces to form tough, impervious film. Powerful detergent action helps clean equipment.

KUPLEX* METAL DEACTIVATORS. Prevent hydrocarbon deterioration caused by metal-catalyzed oxidation. Deactivate harmful copper compounds which speed gum formation, sedimentation, color degradation.



TOLAD FUEL ADDITIVES. Stabilize domestic heating oils, diesel fuels. Inhibit sludge, disperse insoluble residue. Also improve color stability, prevent emulsification.

PRODUCT DEGRADATION



DEHYDRO* ASPHALT ADDITIVES. Cause surface of paving aggregates to become oil-wettable, insuring satisfactory coating in presence of free water. Help refiners meet all-weather asphalt specifications.

*TRADEMARK, REG. U. S. PAT. OFF.

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DIVISIONS OF PETROLITE CORPORATION

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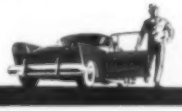
Tretolite Refinery Service Engineers are always available to you for helpful consultation on your refinery problems. Just write, call or . . .

ASK THE MAN IN THE RED CAR



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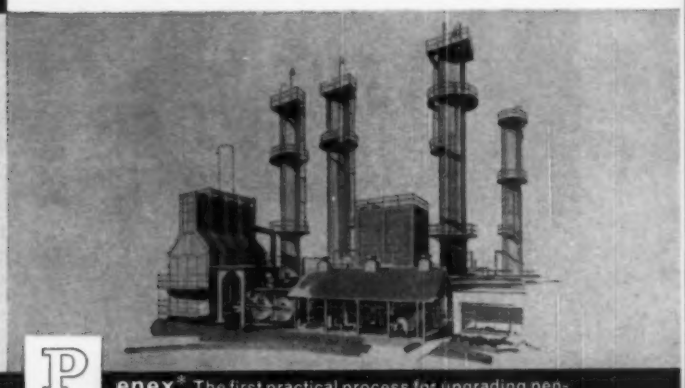
DEMULSIFICATION • DESALTING • CORROSION INHIBITING
PARAFFIN REMOVAL • SCALE PREVENTION • WATER DEOILING • WATER FLOOD ADDITIVES • METAL DEACTIVATORS
ASPHALT ADDITIVES

AR-58-4

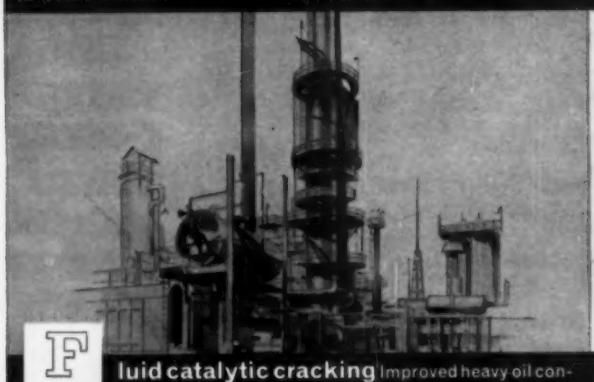
Somewhere on these pages is a UOP answer to most every petroleum processing problem.

Working out the solution to a processing problem can be a pretty tough assignment for any refiner. But this is a UOP specialty and it's highly probable that UOP can come up with the right answer. Perhaps, we don't have all the answers right on tap but our more than 40 years of research and engineering development in oil refining technology is pretty good assurance that we can work them out. Quite possibly you will find

Catalytic polymerization A process for converting propylene and butylenes to high grade gasolines



Penex® The first practical process for upgrading pentane and hexane fractions



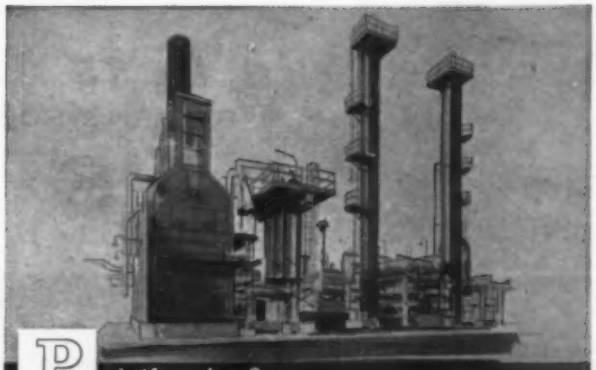
Fluid catalytic cracking Improved heavy oil conversion process for higher yields and octane numbers

Vacuum distillation and visbreaking Efficient, economical processes for feed preparation

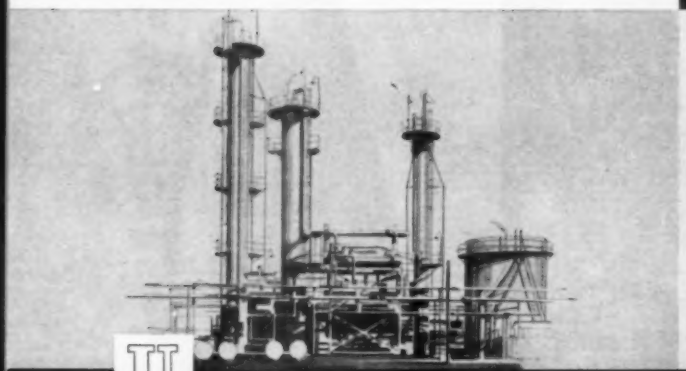
Low pressure coking A process that adds market flexibility

Rexforming® The ideal process to insure your top octane position

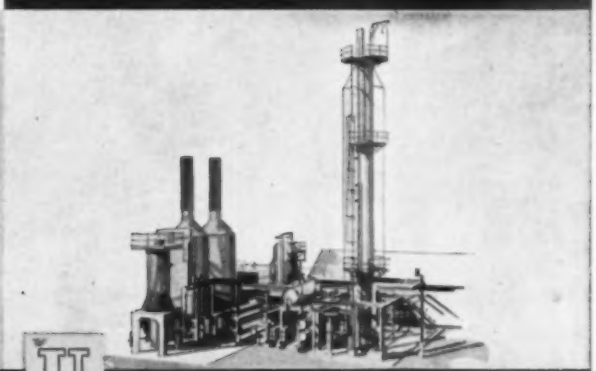
the solution among the processes shown here. For these represent only some of the refining and petrochemical processes UOP makes available to all refiners, anywhere. If you would like to know more about all the refining and petrochemical processes available from UOP we'll be glad to send you our handsome new 36 page brochure describing these more fully. Just drop us a line on your company letterhead.



P latforming® The most popular process for upgrading gasolines



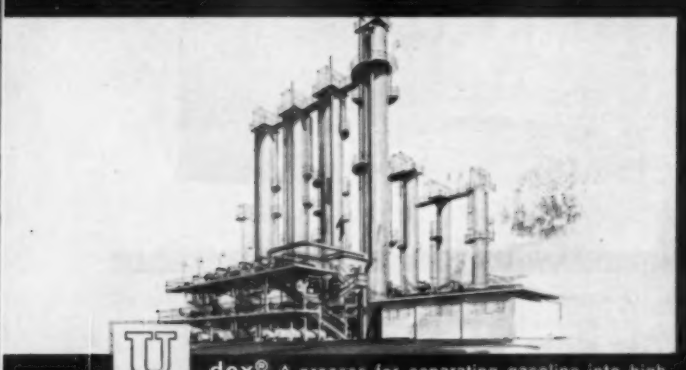
U nisol® A finishing process without octane degradation



U nifining® A modern process for completely purifying petroleum distillates

HF Alkylation A catalytic process for producing alkylate

T hermal cracking An improved design of a basic refining process



U dex® A process for separating gasoline into high and low octane fractions

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MORE THAN FORTY YEARS OF LEADERSHIP IN PETROLEUM REFINING TECHNOLOGY

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STEARNS-ROGER PLAYED A MAJOR ROLE IN

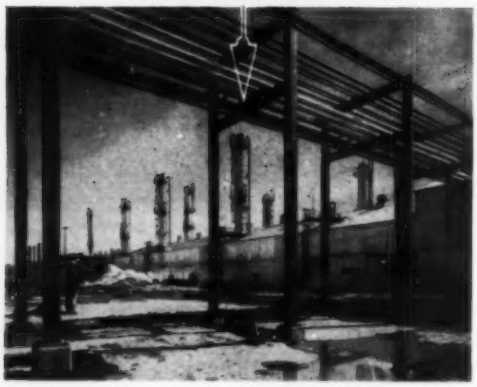
GAS FOR B. C.

The McMahon plant of Pacific Petroleums Ltd., for natural gas beneficiation, liquid recovery, and motor fuel manufacturing at Fort St. John on British Columbia's Peace River was less than two years from contract to operation. The design, engineering and construction utilized Stearns-Roger resources and facilities in both Canada and the U. S. to complete the assignment within the projected time.

The special weather protection problems were routine because of Stearns-Roger's years of experience in cold country process plant engineering. The resultant attention to details of design assured trouble free operation under outdoor weather conditions of 60 degrees below zero.

STEARNS-ROGER ENGINEERING COMPANY LTD.

CALGARY, ALBERTA



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CONSTRUCTION
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MANUFACTURING

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THE STEARNS ROGER MFG. CO. • DENVER, COLORADO

DENVER HOUSTON EL PASO SALT LAKE CITY

Our complete on-time service is available for your next processing assignment, including complete process and physical design, procurement, fabrication and field erection. You need but one order, one contact, one responsible source...Stearns-Roger.

WHEN YOU SPECIFY PETRECO ... YOU BUY CONTINUOUS SERVICE

Petreco electric petroleum treating equipment offers you continuity in *two* senses.

First, in your day-to-day operation, a Petreco installation means the *uninterrupted flow* of a precisely treated product (whether it be a producing or a refining operation).

Secondly, and in the broader sense, it means perfect assurance of *service "follow-through"*—the kind of future organizational support you have a right to expect from a leader in its field.

The results are: (1) the *proper design* for your operation and, (2) a *constant concern* for your treating problems—not just for today, but for the years ahead.

Throughout the petroleum world, Petreco processes *and services* are eliminating many of the problems and uncertainties that used to be consigned to intuitive "guess"timations —operations that Petreco equipment is now controlling with *automatic* regularity and precision.

WHEN YOU SPECIFY PETRECO ... YOU BUY CONTINUOUS SERVICE

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CONTINUOUS • AUTOMATIC • COMPACT • ECONOMICAL OPERATION of the FOLLOWING PROCESSES...

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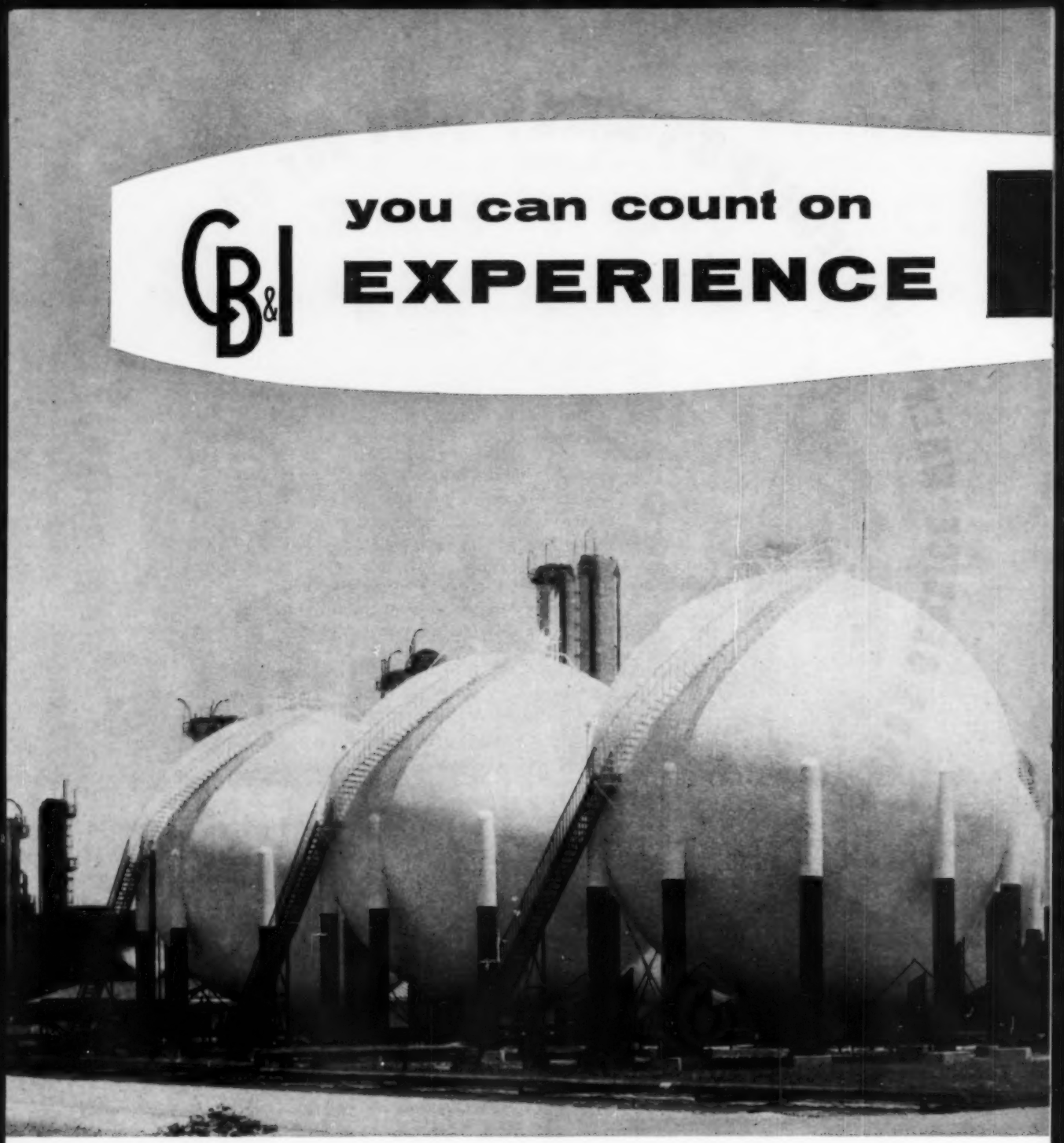
Specialized Petroleum Treating Processes and Equipment—DESALTING • DEHYDRATING • DISTILLATE TREATING • SWEETENING • LUBE OIL TREATING SEDIMENT REMOVAL

AP-58-1



The increasingly complex operations at modern refineries and petrochemical plants calls for the most exacting attention to the important details of design, fabrication and erection of refinery towers, tanks, and allied steel plate structures that can mean success or failure in today's petroleum processing operations.

The years of specialized, successful experience behind CB&I-built structures is your best assurance that you will get the utmost in craftsmanship and the kind of performance for which the particular steel plate structure was designed.

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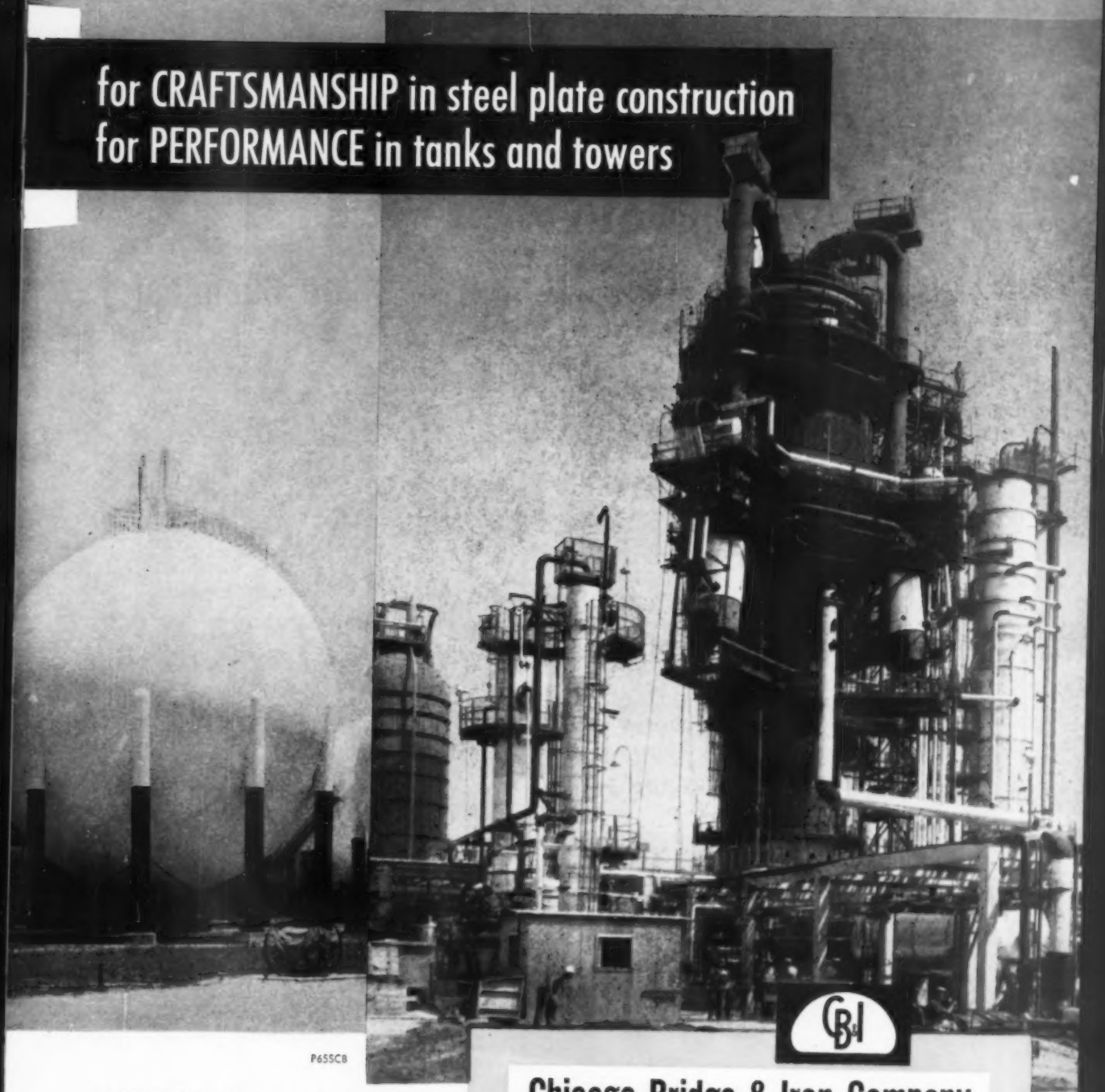

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ABOVE, LEFT: 19 Hortonspheres® are included in the extensive storage facilities furnished by CB&I through The Fluor Corp., Ltd., for the multi-million dollar plant of *Texas Butadiene and Chemical Corporation*, near Houston, Texas.

ABOVE, RIGHT: Components for this Orthoflow Converter, for the new *American Oil Company* refinery at Yorktown, Virginia were fabricated by CB&I and furnished through the M. W. Kellogg Company. CB&I-built components included a reactor, regenerator, vacuum tower, crude tower, absorber tower and catalyst hoppers.

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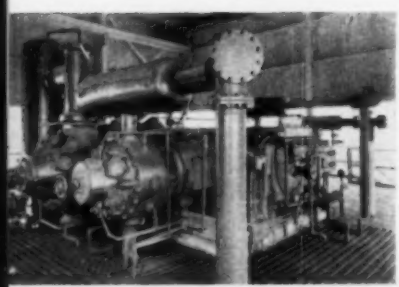

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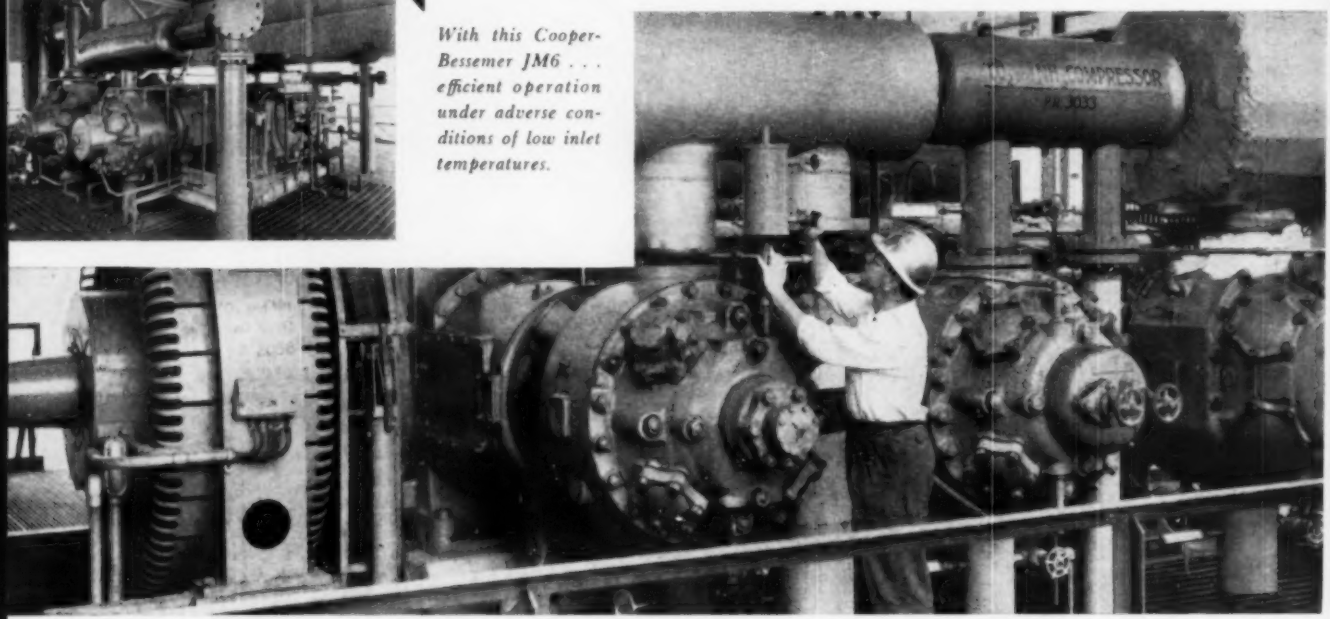

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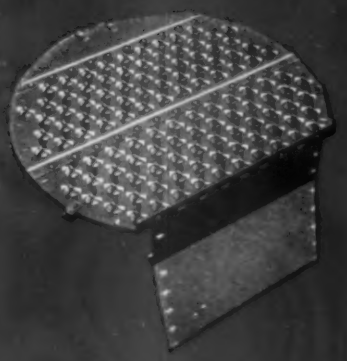

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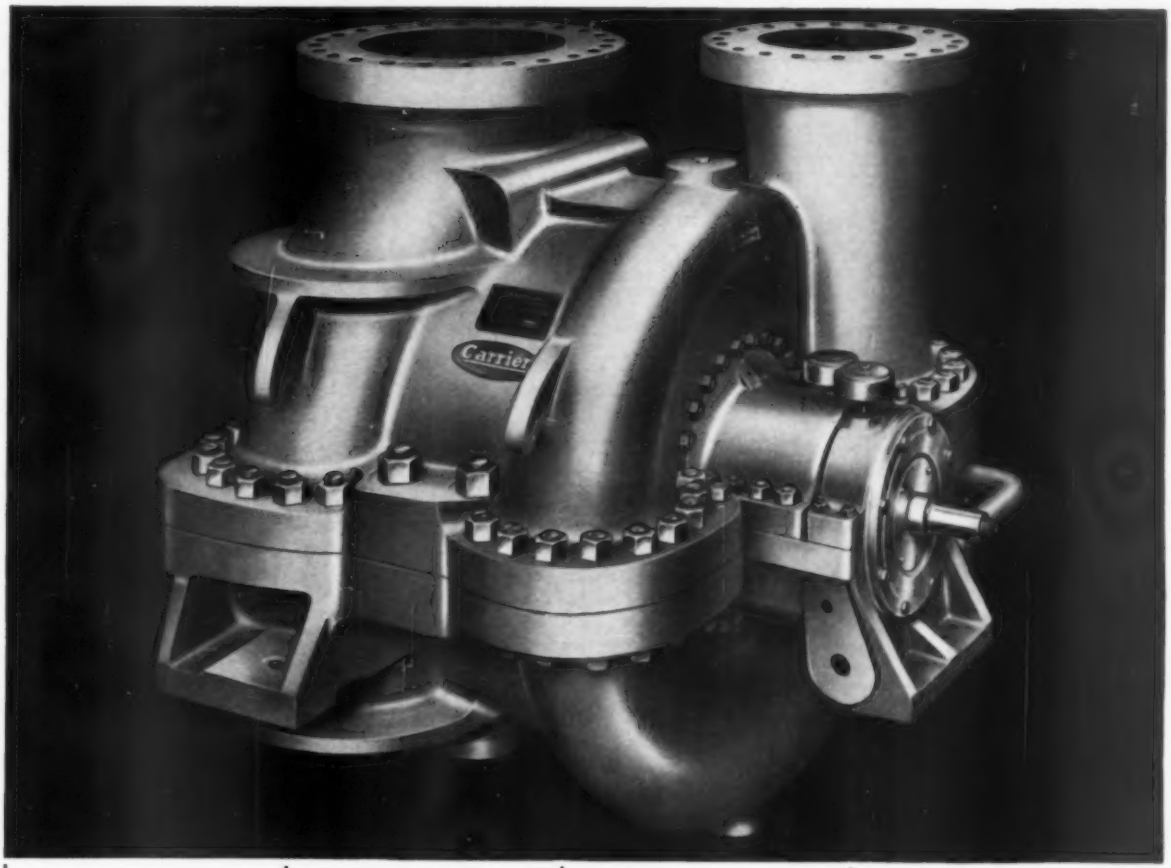

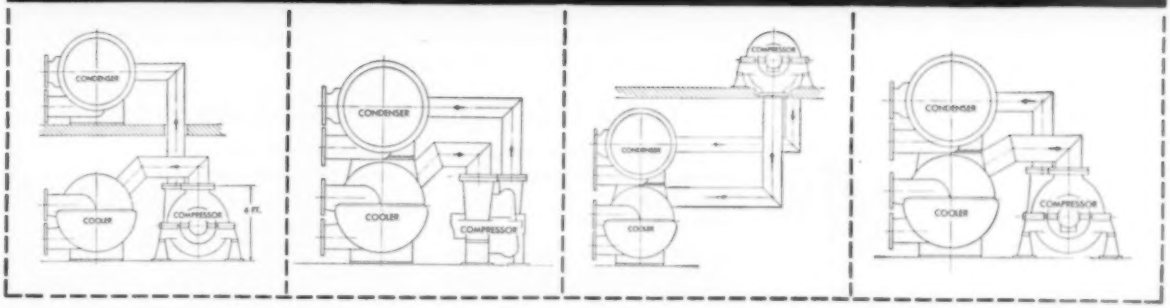

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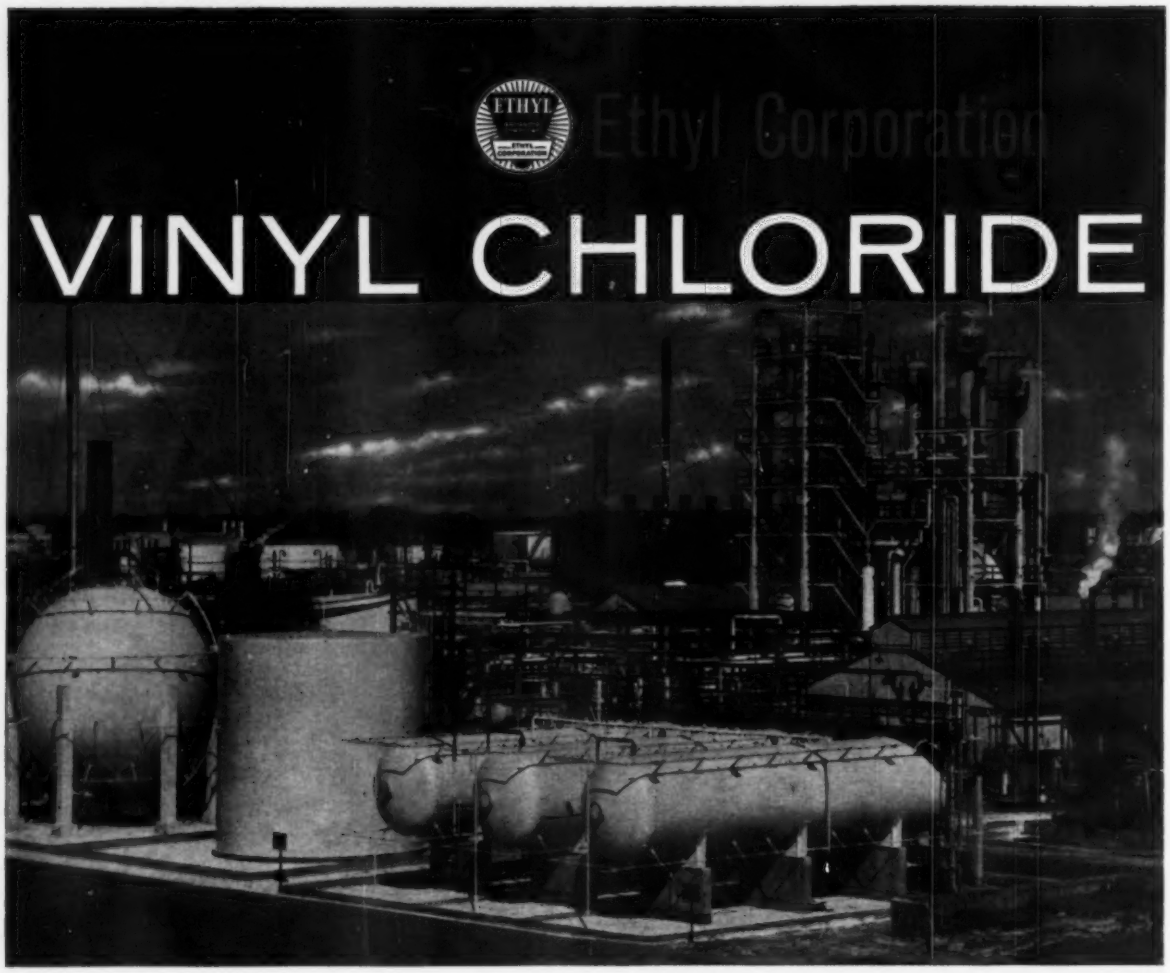

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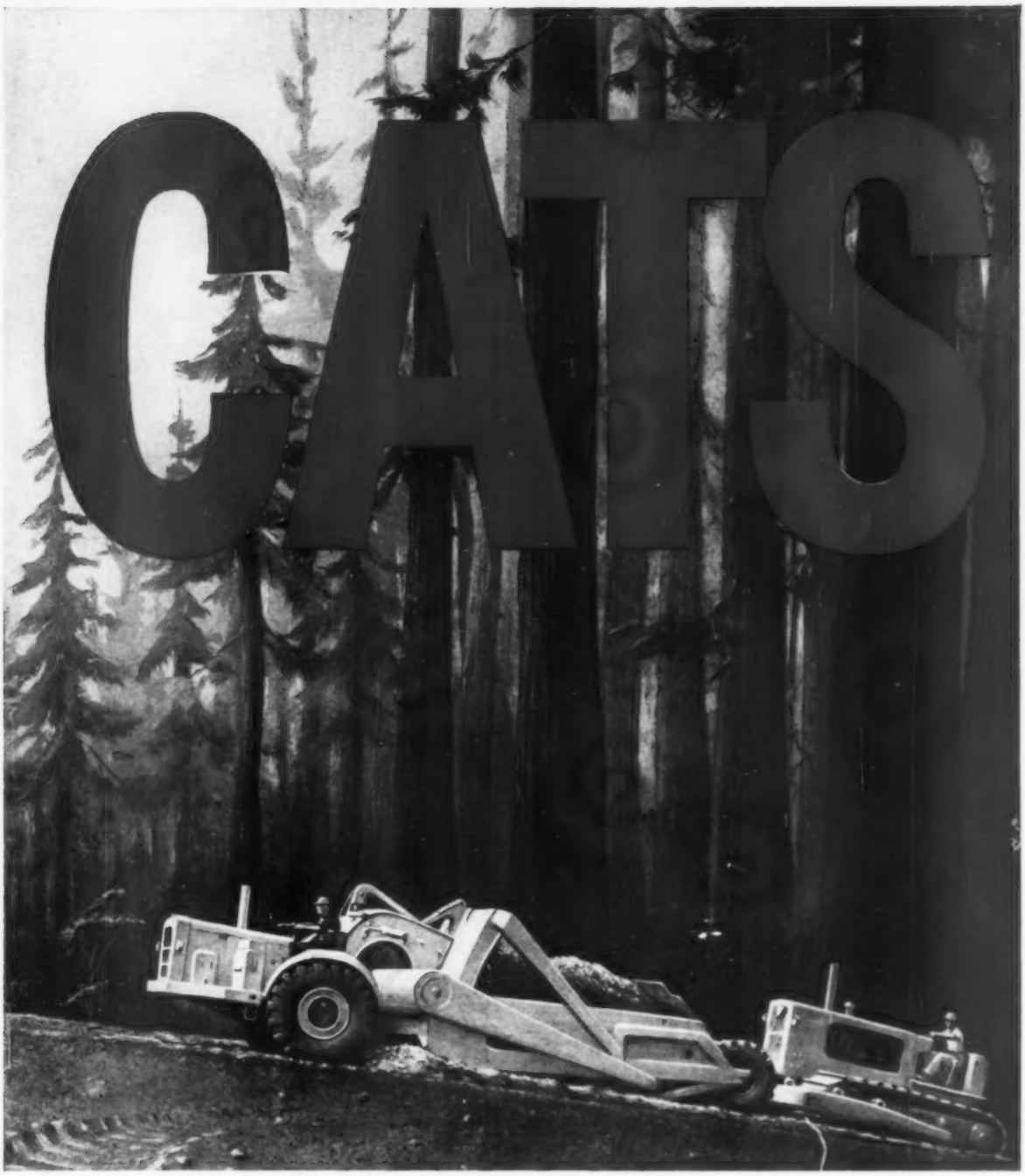

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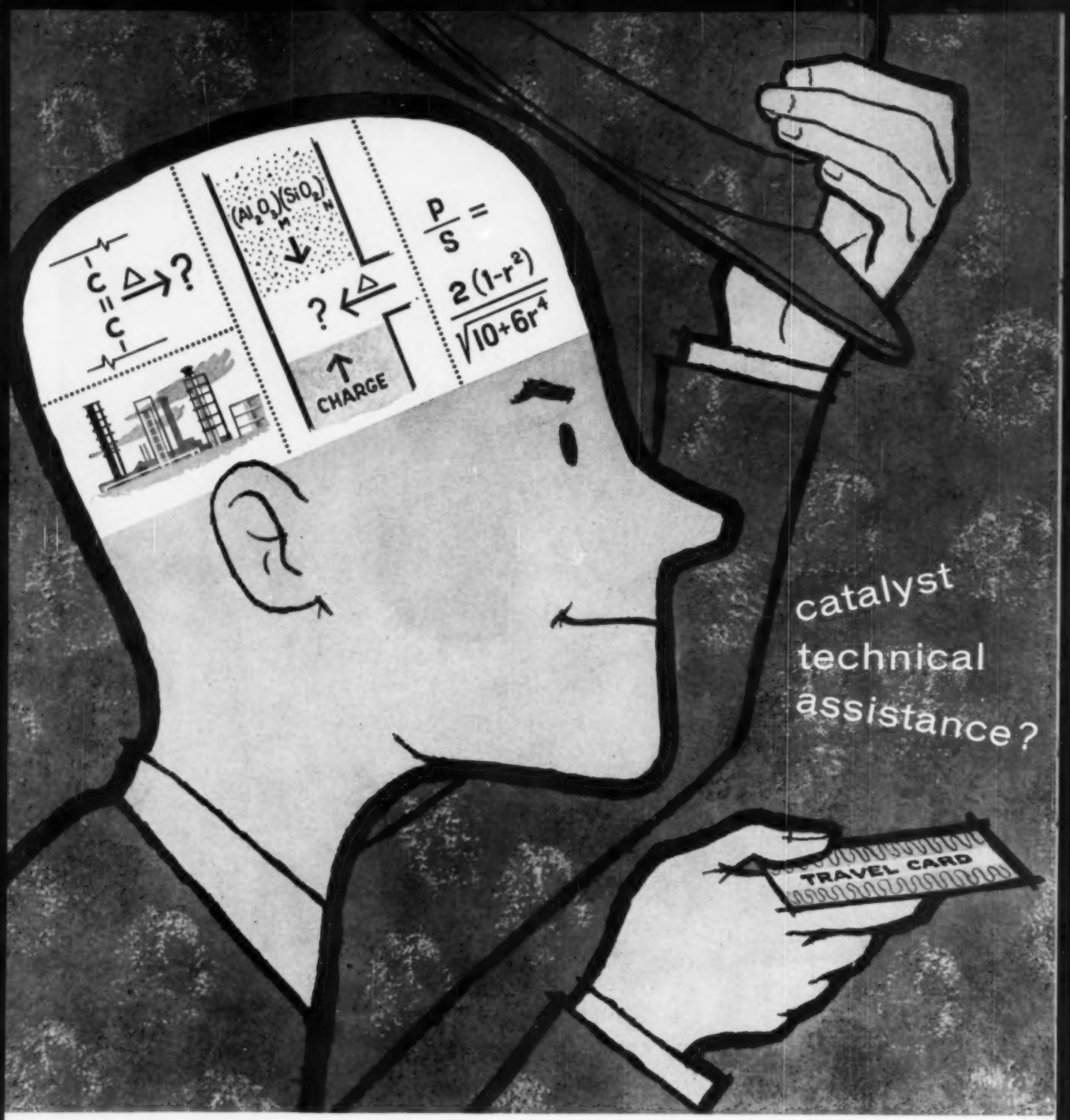

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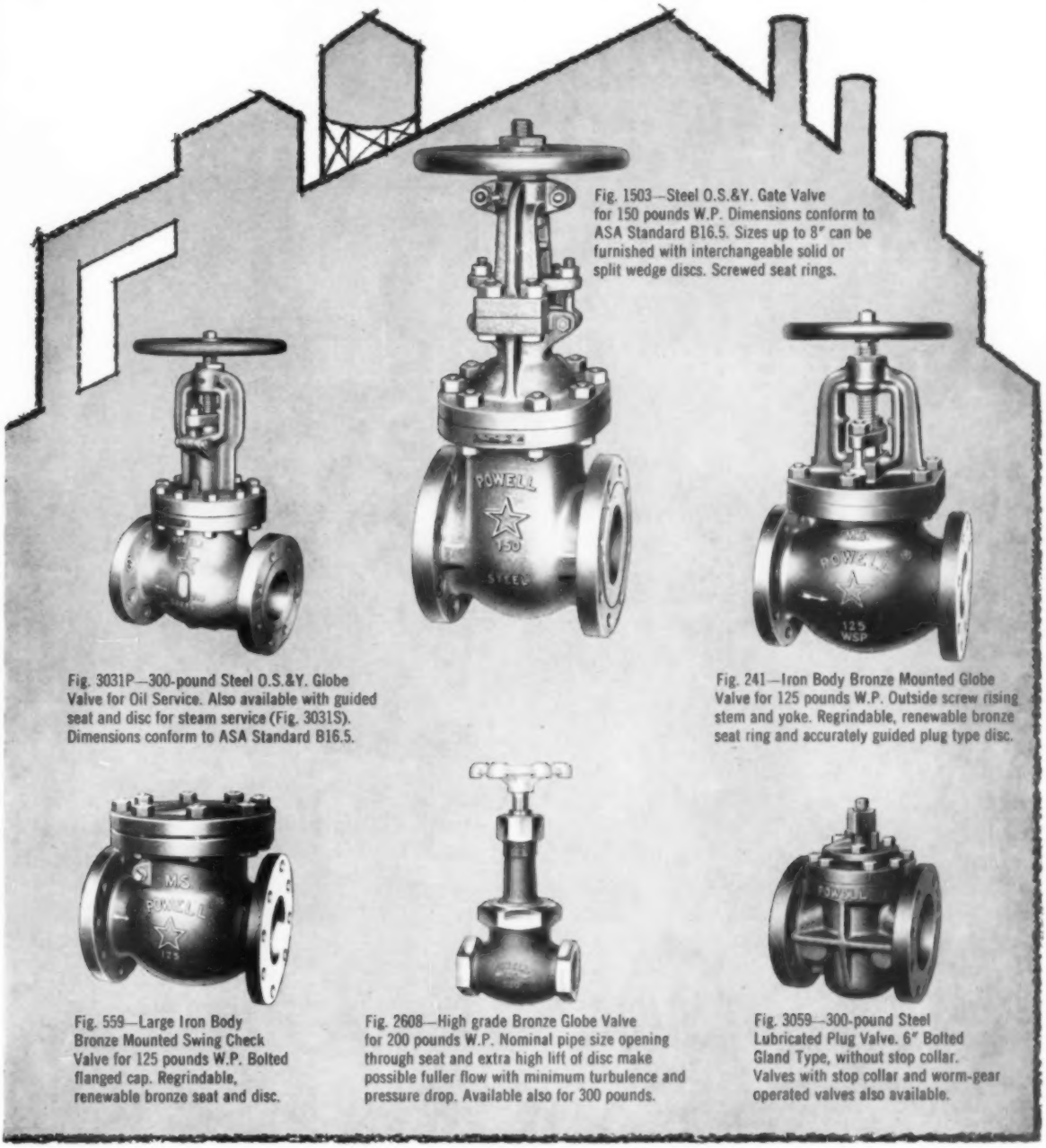

Fig. 1503—Steel O.S.&Y. Gate Valve for 150 pounds W.P. Dimensions conform to ASA Standard B16.5. Sizes up to 8" can be furnished with interchangeable solid or split wedge discs. Screwed seat rings.

Fig. 3031P—300-pound Steel O.S.&Y. Globe Valve for Oil Service. Also available with guided seat and disc for steam service (Fig. 3031S). Dimensions conform to ASA Standard B16.5.

Fig. 241—Iron Body Bronze Mounted Globe Valve for 125 pounds W.P. Outside screw rising stem and yoke. Regrindable, renewable bronze seat ring and accurately guided plug type disc.

Fig. 559—Large Iron Body Bronze Mounted Swing Check Valve for 125 pounds W.P. Bolted flanged cap. Regrindable, renewable bronze seat and disc.

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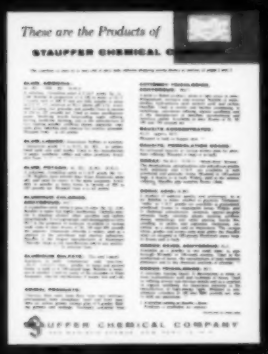

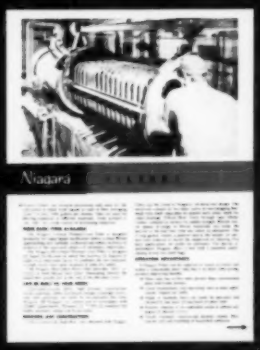

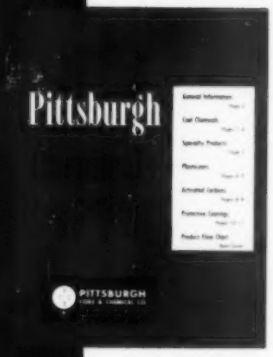

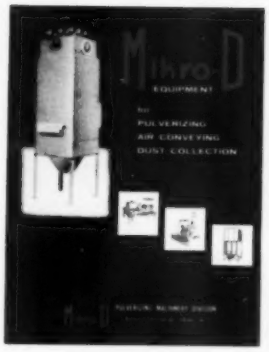

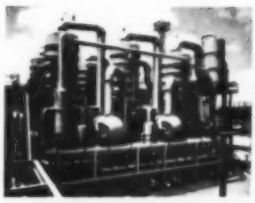

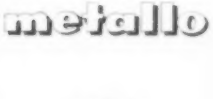

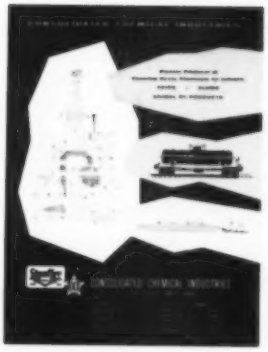

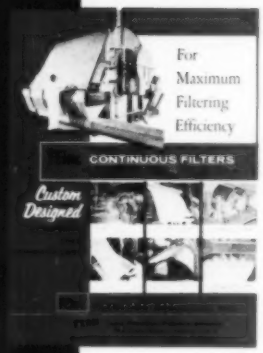

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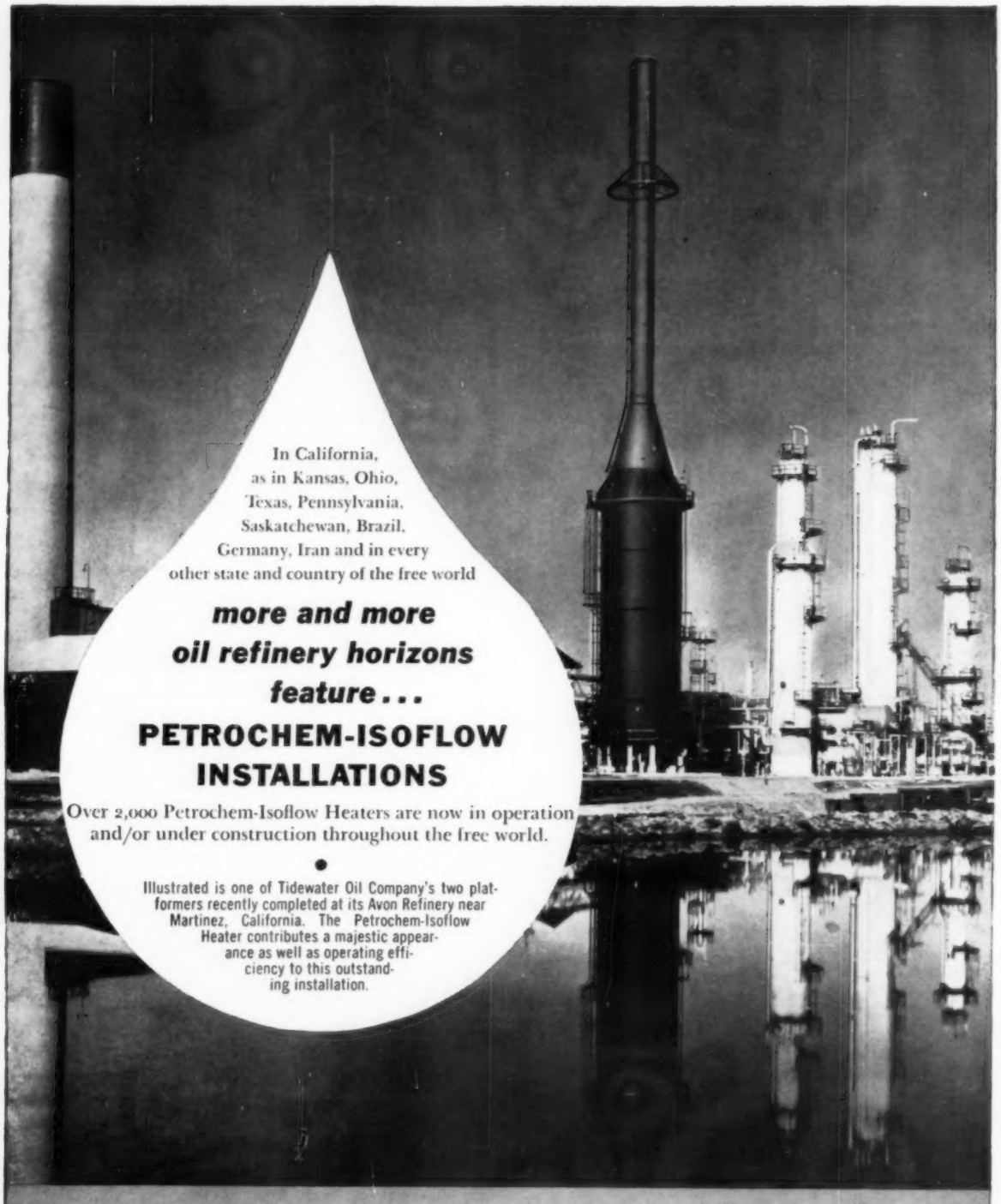

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Higher speeds, better performance of pumps, compressors are showing the way in . . .

BRIGHT NEW HORIZONS IN PROCESS EQUIPMENT

Here are the most recent developments in process plant "machinery" that are markedly influencing design and selection

L. F. Scheel
Machinery Consultant, San Gabriel, California

REFINERY and petro-chemical construction may be experiencing a lull, but not so with the equipment manufacturers. Their new development programs include advancements as astonishing as those experienced in the last decade. Likewise, process engineers are as busy as ever. They are planning new plants at lower costs, with more automation, that operate with less repair and down-time for a higher degree of competition.

Speed Is the Expanded Dimension

Two decades ago the engineer and the operator looked with a jaundiced eye at any speed over that provided by two-pole, 60 cycle, and he preferred a four-pole speed. A decade ago turbo-machinery was introduced to the refinery. This immediately doubled and tripled the speed horizon. Now, the operator does not blink an eye at 15,000 rpm or even at 20,000 rpm. In fact, a Louisiana chemical plant is being placed onstream this summer containing six high speed centrifugal expanders and turboblowers. They operate at speeds of 20,000 to 36,000 rpm and power sizes up to 600 hp!

This is not the first application of such high speed, but it perhaps is the most extensive installation. The expander units have matched impellers, with the driven end compressing air as a brake and speed control media. The prototype of these expanders have demonstrated their dependability in earlier plants and at speeds as high as 60,000 rpm. We have much to thank the air-craft industry for in blazing the trail of higher speeds. (See Fig. 1.)

Standards Are Being Improved

The American Petroleum Institute is doing a tremendous job in resolving a set of minimum acceptable standard specifications for the principal refinery mechanical equipment. Work currently includes:

a. Revisions on process pump standard RP 610.
b. Release of tentative specifications for centrifugal compressors.
c. Release of tentative specifications for mechanical drive steam turbines.

Significance of these specifications was amply stated by a plant manager of one of the principal turbine manufacturers: "I have a volume 4 in. thick filled with oil company turbine specifications. I have another volume half that size filled with contractor specifications. If these API standards are accepted it will be possible to reduce this 6-in. volume to 35 pages. We make as

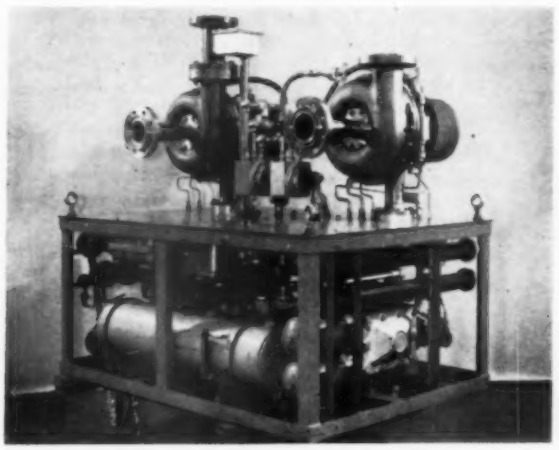

FIG. 1. These two 100 hp, 30,000 rpm methane-hydrogen expanders are packaged units, complete with instrumentation. Accessories are mounted beneath the expanders, with the air governor brake on the far side of the units.
— *Courtesy Stratos Division, Fairchild Engine & Airplane Corp.*

FIG. 2. Typical centrifugal compressor with turbine drive. Accessories are completely packaged.
— *Courtesy Carrier Corporation*

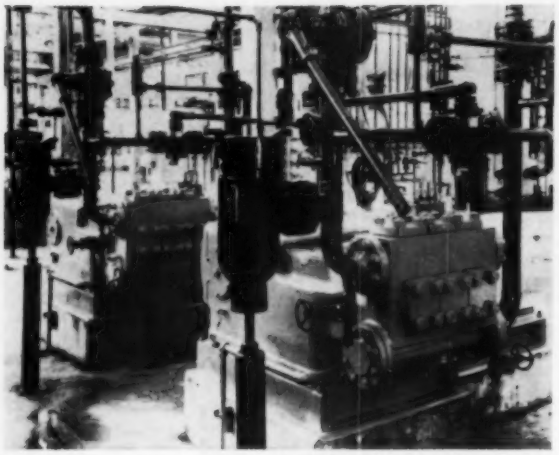

FIG. 3. Modern plunger pump for diethanolamine circulation in a refinery gas stream sulfur removal unit. The pump is rated at 50 gpm, at 740 psi.

— Courtesy Union Steam Pump Company

many as 30 different proposals for a single turbine driver!"

Process pumps. The revised edition of Process Pump Standard RP 610 includes six classifications of pump materials applicable to the full range of refinery service. A simple code material classification "CS-Br" identifies the full trim of acceptable materials for a cold hydrocarbon pump. All pressure parts would be steel. The inner case and bowls would be cast iron. The impeller, case wear rings and bushings would be bronze. The stuffing box gland and shaft would be steel. The stuffing box shaft sleeve would be hardened 11-13 percent chrome.

Mechanical seals are classified in a similar manner. Class code "BSP4" identifies a *balanced single* seal with *plain* end. The mating faces would be carbon and Ni-resist. The seal gaskets would be Teflon and 18-8 SS trim. The vital parts for 95 percent of the pumps required for a job could be specified by such simple *standard* identification.

Layouts of acceptable and time-proved lube systems are to be included in the compressor specification. An interesting story in this regard illustrates the pecuniary merits of such standards. A customer declared the vendor's lube system too costly. They instructed the contractor to make a custom job — which cost *five-fold* that of the vendor's system!

The trend toward package buying of equipment, including all necessary accessories and appurtenances. This applies to both large centrifugal and reciprocating compressors.

This service offers many advantages. It expedites project engineering by consolidating many petty details. The manufacturer often has such accessories on hand and is better informed as to their serviceability. It reduces installation cost since the system is usually prefit and tagged for assembly. There is one responsibility for the completed unit. Manufacturers are often prone to decline this service, especially if the shop load is heavy. The ultimate economy is believed to be the package deal.

A recent factory trip was made to inspect a compressor completely equipped with piping, intercooler and accessories. They had done an excellent job of welding, shot-blasting the pipe exterior and painting. An inspection of the pipe interior revealed the original mill-scale, welding slag and burrs. While this may appear to be in the category of trivia, there are many that can testify as to the importance of interior cleanliness. These *horizon standards* must ultimately include details on interior cleanliness, inhibitor treatment and sealed package shipments.

Definition of electrical hazards. The recently issued API Standard RP-500 does much to clarify and define electrical hazardous areas in refineries. Several years prior to this publication, there was a trend to liberalize the strict interpretation of the National Electrical Code provision for Group B, Class 1, Division No. 1 and No. 2 installations.

RP-500 makes the simple differentiation between Division No. 1 as being *likely hazardous under normal conditions* and Division No. 2 as being *hazardous only under abnormal conditions.*

Area divisions are given specific dimensional limitations. Squirrel-cage induction motors are permitted in Area Division No. 2. This interpretation eliminates the necessity of using the more costly unity service factor, Underwriter's explosion proof motors and fittings. It permits the use of 1.15 and 1.25 service factor, open and fan-ventilated motors.

A new synthetic ammonia plant in the San Francisco Bay area has all equipment out of doors, including the large fan ventilated motor driven reciprocating compressors. Out-of-doors design and use of high service factor motors offer substantial construction economies.

Turbomachinery — Pressure Barrier is Rising

The axial and centrifugal compressor is well adapted to many refinery and petro-chemical plant requirements. These conditions usually include large volumes at moderate pressures. They have proved so dependable, so free of maintenance and down-time, so quiet and clean that they often bring a premium price over reciprocating machines. Fig. 2 shows a typical completely packaged turbo-compressor unit.

Catalytic reformers and hydrodesulfurization units require a low differential pressure recirculation for a relatively small inlet volume condition. These services require reciprocating compressors. Recently a list of 10 such services were submitted to both European and American manufacturers. An American firm replied that eight were within the realm of likely machines.

Pressure barrier for the centrifugal machines is being steadily increased. The latest units installed at Lake Maracaibo operate at 3750 psi. A 4500 psi air compressor was built for NACA. Volume limit for centrifugal compres-

About the Author . . .

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He was machinery consultant and project manager for eight years with the Fluor Corporation, previously spent twenty-three years with the Union Oil Company of California in various engineering and supervisory capacities. His forte is in high pressure gas machinery. He has done extensive work on gas reservoirs, transmission systems and in petrochemical plants.

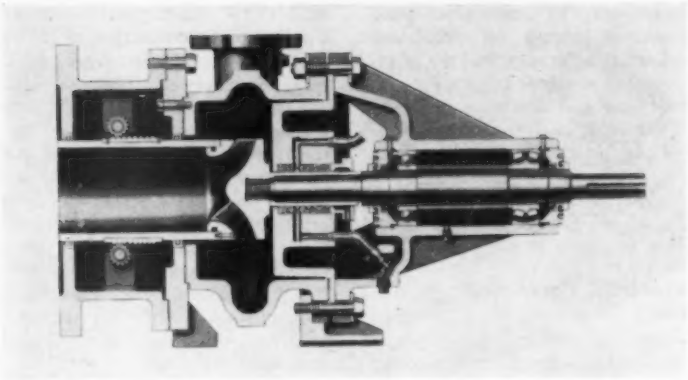


FIG. 4. Cross section of an ACAP pump.
— Courtesy Allis-Chalmers Manufacturing Company

sors has been raised to 170,000 icfm by several manufacturers.

Most interesting innovation in centrifugal compressors is the isothermal approach in cooling the gas to near ambient after each impeller stage. This is accomplished by efficient, low resistance intercoolers built integral with the compressor base. Power economy up to 15 percent and a higher ratio of compression per case is attained.

Butadiene Plants Use High-Speed Machinery

The demand of our national economy for rubber would have exceeded the supply from natural and synthetic sources last year. American enterprise greeted this situation with facilities that increased capacity to produce butadiene by 61 percent. The four largest plants all use the Houdry process to catalytically convert n-butanes to butadiene and butylenes. Each of these plants requires five large turboblower systems.

Texas Butadiene and Chemical Corporation was the first of these postwar plants to be placed onstream. It has two parallel reactor trains; each has a capacity for 40,000 tons of product per year. Two regenerative air axial compressors deliver 175,000 icfm to 20 psig. Each is driven by 10,000 hp, 3600 rpm steam turbines. Hydrocarbon reactor gas is compressed from 2 psia to 160 psia through an axial and two centrifugal cases in series. Each of these six compressors require 4000 hp steam turbines. The alkylation plant has a 4300 hp refrigeration centrifugal compressor. The total power in these nine large turbomachines is nearly 50,000 hp.

Petro-Tex Chemical Corporation has a duplicate-sized plant and in the same area (Houston). The entire air and exhaust output of two 7000 hp gas turbines is utilized for the regenerative air systems.

The gas turbines function on a 100 percent thermal efficiency and supply 65 percent of the process heat requirement. They exhaust at 750 F and 20 psig. The process requires 1100 F.

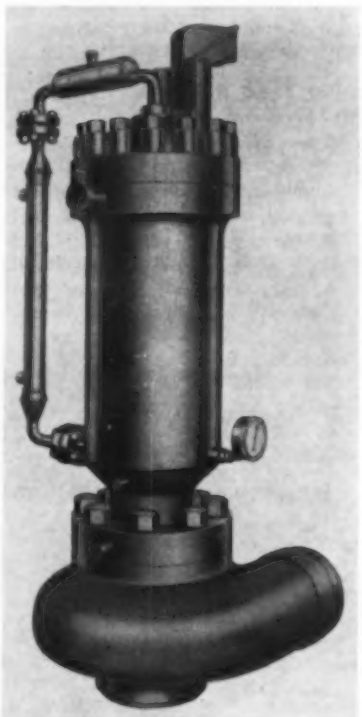
Odessa Butadiene Company has a single train plant and total capacity of 50,000 tons per year. Regenerative air is supplied from a 8750 hp gas turbine-gas generator.

Process Pumps — Better Sealing Systems

Process pump designs were revamped rather extensively some four or five years ago. The pump shaft was shortened and the body made more compact. Some manufacturers set the mechanical seal from the interior, permitting still more compactness.

Most recent advance in process pumps pertains to high temperature mechanical seals. Sealing process pumps operating at temperatures under 400 F, and pressures to 1000 psi, offers no difficulty. The 600 F to 800 F range seal still proposes unsolved problems. In spite of various means of cooling and flushing the protection of the seal face against scuffing still persists, particularly after shut-downs.

One of the more recent successful innovations consists of an isolated seal compartment. A minute radial vane rotor is contained therein. This circulates a few gpm of independent coolant from the cell to a small exterior cooler and returns in an enclosed circuit. Persistent work in this direction should eventually bring about a satisfactory high temperature mechanical seal.



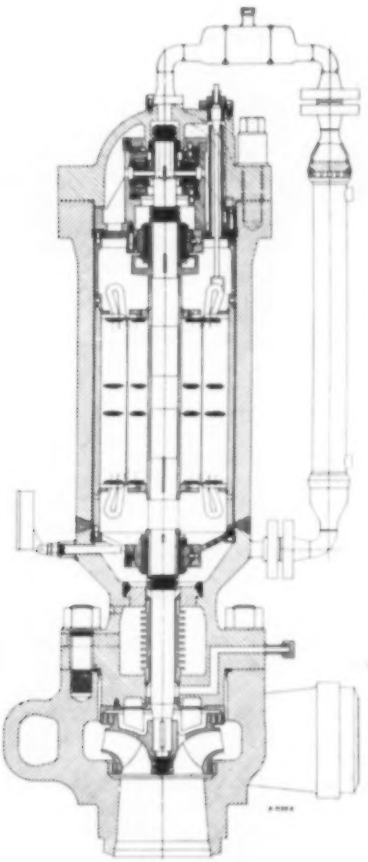


FIG. 5. Vertical wet motor circulator. Cross section shows cooling system; the carbon bearings are water lubricated.
— Courtesy Ingersoll-Rand Company

FIG. 6. This 46 in. impeller is used in a 45,000 bbl per hr oil transfer pump.
— Courtesy Ingersoll-Rand Company

The reciprocating pump is again finding itself on the refinery equipment list. It has a completely different form than when last used as a simplex pump. It is in the form of a small bore, short stroke, high speed triplex or multiplunger pump. (See Fig. 3.)

It is being used, for example, as catalytic converter charge pump, 50 gpm at 2400 ft of head. This is out of the efficient range of the centrifugal pump, although one concern has proposed to do the job at 10,000 rpm and produce a 65 percent hydraulic efficiency.

There is still another shadow on the horizon! High speed reciprocating pumps are being used or considered to circulate highly corrosive solutions, such as amine and hot potassium carbonate used in the extraction of carbon-dioxide and hydrogen sulfide. They are also being used for blade washing of cat cracker compressors and other small volume, high head services. The same design includes a septuplex plunger pump that delivers up to 1000 gpm at 1000 psi (5 in. by 6 in. by 300 rpm by 750 hp). With a smaller 2¼ in. plunger it can handle 210 gpm at 5000 psi. The latter pumps are used extensively for water flooding near-depleted oil fields in secondary recovery projects.

A new variable capacity design feature that suggest further applications. (See Fig. 4). The ACAP pump was designed for handling solids and wide ranges of capacities. The ACAP pump has a movable internal shroud that closes upon an open impeller. The closeness of the shroud to the impeller regulates amount of internal by-pass and subsequent flow. The shroud is attached to a suction tube liner that carries a gear-rack top and bottom. Two pinion gears move the tube and shroud by exterior manual or automatic manipulation. Variable flow is handled at better hydraulic efficiencies than can be realized by throttling conventional pumps.

Canned pumps have been given more consideration. Means of circulating coolant through the rotor and the winding have been developed. (See Fig. 5). A novel size and service pump was made last year. A vertical shaft submerged pump was used for low pressure field transfer of crude oil. The 1250 hp pump handles 45,000 bbl per hour at 55 psi. One of the two 46-in. impellers is shown in Fig. 6.

Better NPSH Corrections Coming?

Process and refinery engineers can look forward to a new technique to determine NPSH hydrocarbon corrections. California Natural Gasoline Association made extensive NPSH tests last year using propane, butane, decane, hot and cold water. They found no evidence to substantiate existing NPSH hydrocarbon correction procedure. They did find dire need for more basic data, such as the vapor to liquid volume release. This data must be correlated with some index of pump suction performance, such as the *suction specific speed*.

Influence of the degree of cavitation on the pump head-capacity performance is a further enigma. There is research on the threshold that will produce much of this information. This data should provide the solution for the occasional bottleneck and disturbing cavitating pump. It is possible that much accepted pump maintenance can thereby be minimized.

Boiler Feed Pumps — Rapid Improvements!

In this era where machinery horizons are moving so rapidly, the word ultimate must be used with discretion. It appears to be apropos for the first super-critical boiler feed pump. The 6500 psi system requires three barrel double-case pumps operating in series. The first pump discharged at 2250 psig and the second discharges at 4380 psig. Both are conventional design. The shafts are sealed by fifteen solid stainless steel rings floating on the shaft. Each ring is mounted in a case and spring loaded to produce a stationary face seal. A leak-off injection arrangement is included in the seal.

These two pumps are driven by 5000 hp, 3580 rpm motors. The 3000 gpm, 570 F, 6500 psi pump is driven by a 5000 hp, 7000 rpm steam turbine. The outer casing presented many design innovations. The case is made of five percent chrome steel forging 9 in. thick. The head is 15 in. thick. The head joint is a double metal gasket arrangement. It has a space between the gaskets and the metal lapped flange face that is connected to the suction 4300 psi. This reduces the gasket differential seal to 2200 psi and the flange seal to 4300 psi.

The head flange is secured by twelve 5 in. diam studs. Usual methods to tighten and preload the bolting were inadequate. The studs are preheated to 525 F before set-up. The shaft is sealed in a manner similar to the lower pressure pumps. A maximum pressure differential of 2200 psi at 570 F establishes a new limit for ring labyrinth bleed-off injection seals.

Fig. 7 is a cross-section of the 6500 psi boiler feed pumps built for Philadelphia Electric Company. American Gas & Electric Company's Breed and Sporn boiler feed pumps handle 7200 gpm at 4550 psi and 22,000 hp on one shaft.

Several other critical-pressure power stations were recently placed in service. This year the Detroit Edison will start the world's largest single turbogenerator, 300 megawatt. A still larger 350 megawatt turbogenerator is in design.

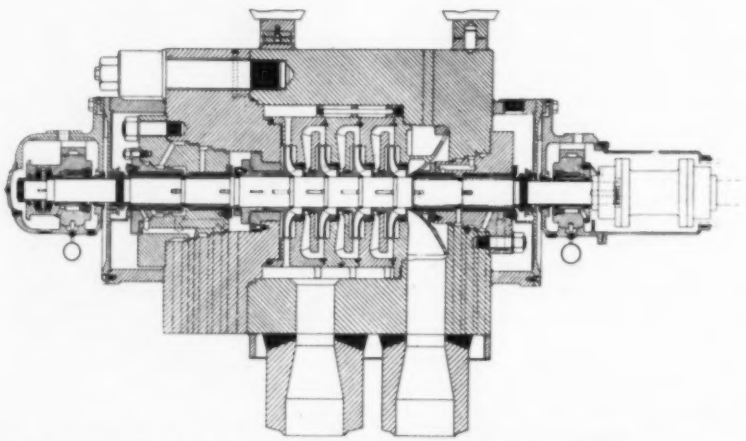


FIG. 7. Cross section of boiler feed pump delivering 3000 gpm, 4300 to 6500 psi, 5000 hp, at 7000 rpm.
— Courtesy Ingersoll-Rand Company

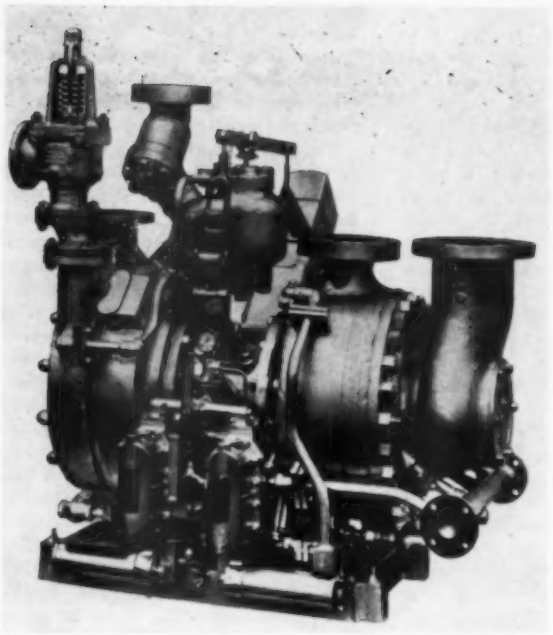


FIG. 8. Integral turbopump. Turbine and the pump are on one shaft, with all accessories included in the package. This unit is rated at 1400 gpm at 1800 psi. — *Courtesy Pacific Pumps, Inc.*

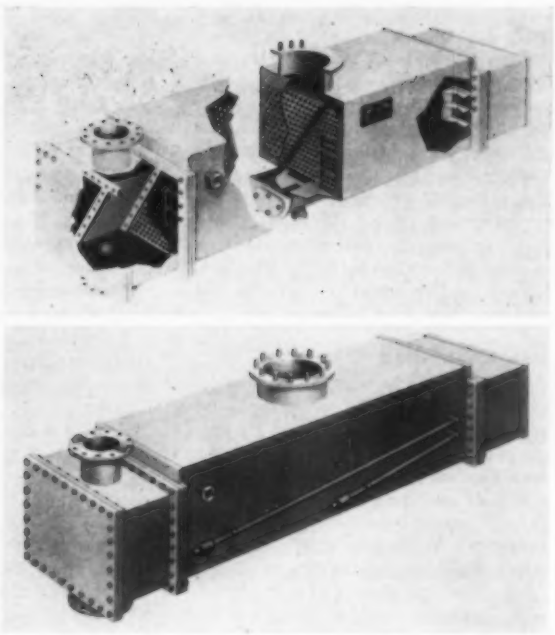


FIG. 9. This packaged surface condenser has integral ejectors and auxiliary condensers. — *Courtesy Southwestern Engineering Company*

Included in the category of innovations in boiler feed pumps is the new turbo-pump. (See Fig. 8). The design exemplifies the trend to compactness. The steam turbine and the feed pump are mounted on a common shaft occupying no more space than either single conventional element. The unit is capable of handling 1400 gpm at 1800 psi and at speeds of 10,000 rpm. The pump impeller includes a unique combination axial-radial vane design. This feature improves the NPSH characteristic.

Compressors — Non-Lube Designs the Latest

Latest innovation in reciprocating compressor design is the non-lube feature. It is expedient to eliminate lubricant in many processes where product contamination, catalyst deterioration, instrument and control disruption is so affected. Non-lube designs include extensive use of dense carbon in the piston, piston rings and rod packers. Teflon is also being used with some degree of success.

Some non-lube pistons are made up of alternate rings of carbon and aluminum alloy distance pieces. Exterior provisions are provided to periodically rotate the piston and thereby extend the wear. Other pistons are equipped with segmental carbon rings and expanding springs. Still other pistons have an adjustable carbon wedge riding-shoe. Vertical and "V" model compressors have the advantage of less piston wear. Extra long or a double distance piece is needed to avoid oil carry-over on the piston rod.

The Swiss have been using an interesting non-lube air compressor since 1935. They use a labyrinth seal profile formed by two round threads on the surface of the piston and the cylinder liner. Its success results from a close and true fit.

The advent of 10,000, 15,000 and 35,000 psi compressors in the petrochemical plants have emphasized the importance of alignment, metallurgy and finishing technique of all contacting surfaces. Some surfaces are being honed and lapped to values less than 10 microinches MSR.

Compressor valves are undergoing important development. One manufacturer has a new research laboratory devoted exclusively to this purpose. There is much to be done in determining valve flow characteristics and correlating its effect in compressor cylinder performance. Field tests have demonstrated that the valve resistance coefficient can be reduced to half that of the existing designs and one-third that of the valves used two decades ago. Nylon is being used successfully as a valve material for discs and poppet elements at temperatures less than 250 F.

Gas Engines — Supercharging Is the Vogue

Supercharged two-cycle gas engines came into maturity last year. The two-cycle engine had faltered over the past decade while developing the technique of smooth operation at high compression in the power cylinders. The compression pressure was practically doubled in this period. With the advent of supercharging, it was raised to 280 psi. The BMEP was likewise increased from 60 to 110 psi with supercharging and higher compression. The four-cycle engine BMEP was raised from 90 to 160 psi by the same improvement. Fuel economy was reduced to 7000 net Btu per hp-hour for the two-cycle engine and to 6000 Btu for the four-cycle engine.

Two-cycle engine manufacturers have turbocharger package kits available to convert naturally-aspirated engines. Several California gas operators have made such conversions. They report 20 to 30 percent increase in payload capacity and satisfactory performance.

New factory-equipped supercharged engines are being rated some 35 percent better than earlier high compression, naturally-aspirated and gear driven supercharged units. Superchargers have up-rated the larger integral models to the 3000-3500 hp range.

Independent four-cycle, 4500 hp engine gear-driven centrifugal compressors have come into much favor in the past few years. Thermal efficiency of 41 percent is claimed. This makes it the most efficient prime mover on the market. The unit is well adapted for automation. Several stations have been

so equipped and functioning satisfactorily for the past few years. Other systems and stations are planned using similar equipment.

The so-called Memphis decision pertaining to interstate gas pricing has brought all gas transmission work to a screeching halt. Meanwhile, three of the principal gas engine-compressor manufacturers have recently or are about to complete extensive additions to their production facilities. This is a typical manifestation of faith in the future of American industry.

Instrumentation

The automatic compressor station mentioned forms a large silhouette on the equipment horizon. These stations are placed ON and OFF operation by push-button, some 80 miles distant. Pertinent operating data is telemetered to the control center. The station includes 52 automatic safety controls that function in one of the following ways:

A. Alarm
B. Shut-down with restart
C. Shut-down with lockout

The station has three independent fire detection devices. They respond in various manners depending upon the severity of the conflagration. The response ranges from sounding an alarm to complete shut-down, by-pass, vent the yard piping and smother the station building with carbon dioxide.

A small instrument that is destined as an essential on every valuable rotating and reciprocating machine is the vibration-sensitive switch. It has a small pendulum that has a spring set calibration in units of "G." It detects any slight malfunction. A vibration displacement and the acceleration involved therewith triggers the switch, which in turn shuts down the machine.

Possibilities of analog and digital computers in automatic control of refinery operation loom high on the horizon.

A digital computer that will essentially "close" the control loop for a catalytic polymerization unit under construction at Texaco's Port Arthur, Texas, refinery, has been announced, is scheduled to go into use next year. Analog/digital converters incorporated into process data loggers are now installed in several refineries to "read out" corrected flow rates and other key operating data to assist the operators.

Regent Refining Company, Ltd., has done considerable work in commercial application of electro-pneumatic and electro-hydraulic control systems at their Port Credit, Ontario, refinery. While this is just one of the many refineries using such systems, the fact that they have equipped new process units completely with electronic-type systems is significant.

The more sensitive and accurate temperature and pressure "pick-ups" are making process control more reliable. Better systems have caused researchers and engineers to spend considerable time studying process system dynamics; as time goes on, more and more money will be spent to learn about process as well as control system dynamics. This is essential, of course, to ultimate achievement of *fully automatic* control.

One of the most complete recently published reports on advances in instruments and control systems was published in *The Refining Engineer* for September 1957, titled AUTOMATION '57.

Closure

New evidence of better packaging of equipment is manifest in nearly every line. Boilers have been neatly packaged for the past five or six years. Surface condensers with integral ejectors and traps are designed for direct mounting. (See Fig. 9). It follows — where there is a need, there is a service.

★ ★ ★

Latest Lines In . . .

Refinery Equipment

Instrumentation and Control

Portable Oxygen Indicator

101 An M-S-A portable oxygen indicator for checking oxygen deficiency or conditions has been developed by Mine Safety Appliances Company. The new instrument measures the percent of oxygen throughout a range of zero to 25 percent by volume with an accuracy of ± ½ percent. Meter scale follows a square root function and has the 5 percent graduation near the center.

Oxygen is measured by a detector cell in which a gas or atmosphere to be analyzed is circulated through a hollow carbon electrode. The carbon electrode and a zinc electrode are supported in a container filled with a special electrolyte. Oxygen diffuses through the porous carbon and combines with hydrogen ions brought to the electrode by electric current produced by the detector cell. The hydrogen ions polarize the cell, but the oxygen acts to depolarize the cell, thus changing the terminal voltage and meter reading according to the amount of oxygen present. *Mine Safety Appliances Company.*

High Range Gas Chromatograph

102 An instrument providing quick analysis of gases and liquids with boiling points up to 350 C is the new Beckman GC-2 gas chromatograph. The unit adapts the fundamental principle of gas chromatography, utilizing a tubular column packed with a material that separates components by passing them through the column at different rates. Carrier gases include hydrogen, helium, carbon dioxide, nitrogen, or argon.

Regulated flow control increases overall stability and eliminates pressure surges which give false readings on chromatograms. Instrument is line-operated (115-v, a-c) and can be connected to a 1-millivolt high-sensitivity potentiometric recorder for reproducing values of 0.1 percent full scale. *Beckman/Scientific Instruments Division.*

Digital Computer for Process Control

103 The RW-300 digital control computer by The Ramo-Wooldridge Corporation is the first digital computer engineered specifically for automatic control of industrial processes, for data logging, and for test stand operation. Although providing the essential capabilities of larger, more expensive computers, the unit is desk-size and moderately priced.

With the control system, measuring devices send signals to the computer where input conversion equipment converts the signals into digital form. The computer next interprets the input data and then proceeds to the principal control calculations, which include equation solving, interpolation, integration, maximizing and minimizing, averaging, correlating, and smoothing. The results actuate plant controllers to make the appropriate changes in the process. *The Ramo-Wooldridge Corporation.*

Electronic Infra-red Analyzer

104 A new electronic infra-red analyzer is announced by Mine Safety Appliances Company. The LIRA Model 200 provides instantaneous analysis of flowing chemicals with high accuracy. Accuracy of measurement is one percent of full scale. It operates on the principle of direct deflection rather than electrical-null-balance.

The unit can be used to detect any variation in the composition of a flowing liquid in order to trigger automatic corrections where necessary. A 5-position sensitivity test switch, part of the instrument's front panel, permits checking without exposing the chassis. Also part of the panel is a 5-position voltage test switch which provides readings of the B-plus, oscillator and plate voltages of the first amplifier, as well as the infra-red source and cathode voltages of the amplifier's output tube. *Mine Safety Appliances Company.*

Null-Balance-Vector Instruments

105 An outstanding feature of the null-balance-vector pneumatic instruments manufactured by Republic Flow Meters is that span of pressure or pressure differential to which the mechanism will respond may be changed within an extremely wide range by a screwdriver adjustment or by turning a knob. Range span as wide as 20 to 1 is possible with the differential pressure transmitter. Low air consumption — less than 0.2 std cu ft per min — and high output capacity as well as high gain are realized from the non-bleed pneumatic amplifier. A common pneumatic component is used throughout the line. Several instruments can easily be converted from one function to another by changing a few parts. *Republic Flow Meters Company.*

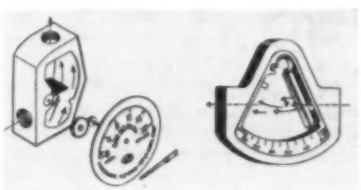
Non-Indicating Pneumatic Transmitter

106 A new non-indicating pneumatic transmitter which combines extreme sensitivity with easy calibration and maintenance has been developed by Manning, Maxwell and Moore, Inc. The Type 1260 transmitter is accurate within ½ of 1 percent of scale range and sensitive within

1/10 of 1 percent of pressure range. The transmitter consists of an input Bourdon tube, a flapper positioned by the input Bourdon tube, a feedback Bourdon tube with an attached nozzle which maintains a constant air bleed, and a pneumatic relay. Bourdon tubes are available in 5 different materials in ranges from 0 to 100 in. of water pressure to 20,000 psi. *Manning, Maxwell & Moore, Inc.*

Indicating Flowmeter Line Enlarged

107 Seico Instrument has enlarged its line of indicating flow-meters for air, gases, and liquids. Standard liquid flow instruments are available with aluminum and brass bodies for pressures up to 2000 psig, and with special body materials for corrosive applications. Scale ranges run from 0 to 6 gal per hr (0 to 0.1 gal per min) up to 0 to 6000 gal per hr.



Series 1050 gas flow models are now available with scale ranges from 0 to 30 cu ft per hr (0 to 0.5 cu ft per min) up to 2400 to 60,000 cu ft per hr. The gas flow instruments have a gear-driven pointer with 4½ in. to 6 in. round dials and 180 or 240 deg scales.

In operation, a portion of the flow acts upon a movable vane. In the liquid flow instruments, the vane is the pointer and travels under a transparent plastic cover, permitting visual inspection of flow. In the gas flow instruments, the vane operates a gear-driven pointer. *Seico Instrument Division, Eclipse Fuel Engineering Company.*

Pressure Pickup for Rugged Service

108 A new pressure pickup, known as the Type 4-322, and designed for applications where physical abuse is a problem is available from Consolidated Electrodynamics. With its unbonded strain-gage sensing element encased in a stainless steel cube, the unit will operate within specifications on line pressures up to 350 psi, while measuring pressures in ranges of ±7.5, ±12.5, ±25, and ±50 psid.

Internally, the pickup utilizes the unbonded-strain-gage principle, with 4 active arms of a Wheatstone bridge arranged in a spring-type sensing element. Pressure against the force-summing diaphragm changes the resistance of the active arms and causes an electrical output precisely proportional to applied pressure. *Consolidated Electrodynamics Corporation.*

Differential Pressure Transmitter

109 The Masoneilan differential pressure transmitter No. 4811 includes a variety of design refinements developed to assure optimum performance for flow or liquid level applications. Accuracy has been established at 1 percent of range span, with minimum hysteresis and nonlinearity. Damping is built in at measurement source and distortion due to outside forces acting on the cover is eliminated. Static pressure effect is less than 0.2 percent per 100 psi change.

Range of the transmitter is adjustable between 20 and 200 in. of water with suppression up to 100 in. on either high or low-pressure side. Range adjustment includes threaded beam and adjustment disk permitting changes over a 10 to 1 adjustment range. *Mason-Neilan.*

Standardized Heat Exchangers

110 A new, pre-engineered, standardized line of exchangers has been developed by American-Standard. Extreme flexibility has been provided in materials, sizes and arrangement of components, mounting position, tube side passes, and nozzle orientation. Adaptable for use as heaters, coolers, vaporizers or condensers, the exchangers can be built to handle any combination of liquids or gasses. Featuring a floating head and removable bundle, they are available in 1, 2, and 4 pass designs. *American-Standard, Ross Heat Exchanger Division.*

Manufacturer Acquires Vessel Tray Business

111 Wyatt Metal & Boiler Works has announced the purchase of the tray business, including all patents, drawings, dies, jigs, and fixtures, of the Gilbert & Barker Manufacturing Corporation. This acquisition expands the engineering and manufacturing facilities for producing tower internals.

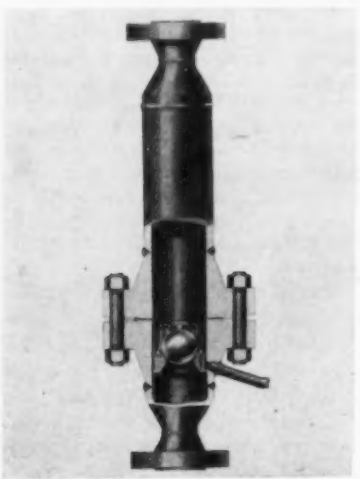
All trays are trial-checked for fit prior to shipment. When vessels are fabricated in Wyatt's shops, trays are installed prior to shipment for economy. *Wyatt Metal & Boiler Works, Inc.*

Variable Orifice Desuperheater

112 A new variable-orifice desuperheater has been announced by Copes-Vulcan Division, Blaw-Knox Company. The desuperheater consists of a section of steel pipe enclosing a self-regulating orifice extending around the full 360 deg and a weighted ball held in concentric position by springs. Cooling water, under the control of a diaphragm-operated valve responsive to a temperature controller, enters the orifice chamber at a uniform rate of flow around the full 360-deg periphery.

In operation, the force of the steam flowing through the desuperheater raises the ball an amount determined by weight of the ball and amount of steam flow. Introduction of cooling water is further aided by the aspirating effect created by pressure drop in the steam passing through the annular restriction between the ball and ring.

The desuperheater holds final temperature within ± 5 F with final temperature as low as 10 F above saturation temperature. It is available for pipeline sizes from 2 to 14 in., and for pressures up to 2500 psig. *Copes-Vulcan Division, Blaw-Knox Company.*



High Volume Filtering Unit

113 A new stainless steel portable filtering unit, announced by S. Blickman, Inc., is especially designed for handling hot fluids. Available for either batch or continuous operation, the filter will remove particles of 10 microns or over at 3½ gal. per min. Total capacity of the unit is 16½ gal.

In operation, fluid is drawn into the filter through a vacuum, and a fine filter removes sludge and impurities. The filtering element is contained in a cartridge that provides 15 times the filtering area of a flat filter paper disc of the same circumference. Liquid is drawn out through a hose provided with the unit. At the turn of a control lever, the liquid is circulated through the filter cartridge. Clean liquid is then transferred from the filter through the same hose that served to draw it out. In continuous operation, the unit may be either gravity or pump-fed. *S. Blickman, Inc.*

Induced Draft Fluid Cooler

114 A new induced draft, horizontal air discharge fluid cooler has been announced by The Trane Company. The unit is available in 9 sizes with a capacity range of from 1 million to 10 million Btu per hr.

The cooler consists of 3 basic components — one or more extended surface heat transfer coils with mechanical fin-to-tube bond, a propeller fan with drive, and steel support structure. Fluids to be cooled are pumped through unit cores and cooled as air is drawn over finned tubes by the fans. Liquids or vapor can be cooled or condensed from a maximum of 800 F to a final temperature of 20 deg above ambient temperatures, at up to 1000 psi working pressure. *The Trane Company.*

Filter Cake Thickness Detector

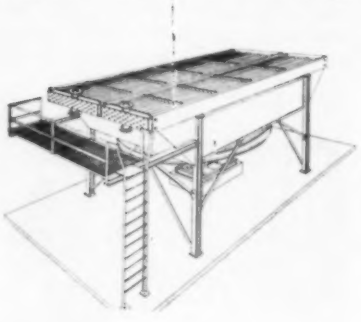
115 The Duriron Company has announced the Durco-Enzinger filter cake thickness detector. When the cake reaches its predetermined maximum allowable thickness, the detector triggers the next step in the filtration cycle, or sounds an alarm to warn the operator of a manually controlled unit. Operator need not rely exclusively on total pressure rise within the filter tank or elapsed time to tell when filter is full of cake. The detector is offered as optional equipment on all sizes of Enzinger filters and as an integral part of completely automated filtration stations. *The Duriron Company, Inc.*

Air-Cooled Heat Exchangers

116 Coynco Products is offering 2 new lines of PowAirFin heat transfer units utilizing modular construction. One series of units, designated as Type G, is available in forced

and induced draft structures, sizes from 6 ft by 6 ft through 10 ft by 24 ft. The larger series of Type H structures covers ground areas from 12 ft by 12 ft through 16 ft by 24 ft.

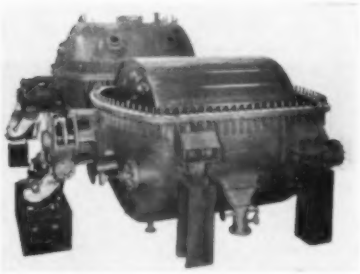
Both new types of units feature an integrated stress air chamber design



which, coupled with heavy gage steel construction, structural shape columns and special sway bracing, results in greater rigidity and strength of structure, and also allow ease of field erection with a minimum of labor expenditure. *Coynco Products Inc.*

Rotary Drum Pressure Filter

117 The new pressure type rotary drum filter manufactured by Goslin-Birmingham, has a hydraulic ram to keep the drum seated against the valve. This enables the filter to have internal bearings and the valve mounted directly on the vat, thus saving floor space with a more compact design. The drum may be dressed like a conventional vacuum filter by merely removing the cover. This filter has been used primarily in the propane dewaxing field but other processes are utilizing its design. For instance, an automatic precoat device may be added to give a



pressure precoat filter. The unit is available in sizes from 6 sq ft to 400 sq ft. Normally pressures are limited to 100 psig, but special designs may be developed to higher pressures if necessary. *Goslin-Birmingham Manufacturing Company, Inc.*

Pumps and Compressors

New Blower and Gas Pump Design

118 A new blower has been developed by Roots-Connersville for handling air and gas. The blower features a vertical arrangement of the impellers providing horizontal inlet and discharge connections for more convenient piping. Delivery of completely oil-free air or gas is assured by double seals on the shafts — a multiple labyrinth seal plus a positive oil seal.

Both blowers, designated type RAS, and gas pumps, designated type RGS, have identical volume and pressure ratings. 36 sizes are offered to cover a capacity range of from 2000 to 14,000 cu ft per min at 6 psig and from 1500 to 8000 cu ft per min at 10 psig. The standard unit is constructed of high grade cast iron, but it is adaptable to other materials. *Roots-Connersville Blower, one of the Dresser Industries.*

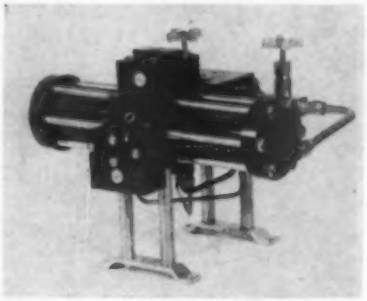
Compressor Turbocharging Conversion Kit

119 Through use of new conversion kits developed by Cooper-Bessemer, horsepower ratings of many existing 2-cycle engine driven compressors can be increased substantially. Completely integrated engine auxiliaries have been designed and are being built for all current V-angle Cooper-Bessemer 2-cycle engines. In addition to increased horsepower, field conversion kits provide engines with greater overload capacity. Engines with turbochargers modified for altitude pull their full sea level ratings at elevations up to 7500 ft.

Two types of field conversion kits have been developed. The "parallel" system is an all-exhaust-driven turbocharger auxiliary that complements the existing engine reciprocating scavenging pumps. The "series" kit is an all-exhaust-driven turbocharger introduced into the engine air intake system as a first stage of compression. Basically, the field conversion kits provide a more abundant supply of cool, clean air from scavenging the cylinders and for combustion of fuel. *The Cooper-Bessemer Corporation.*

Check Valve System for Glycol Pump

120 A new check valve system for the "PV" Series glycol pump is announced by Kimray, Inc. All check valve piping has been eliminated by the



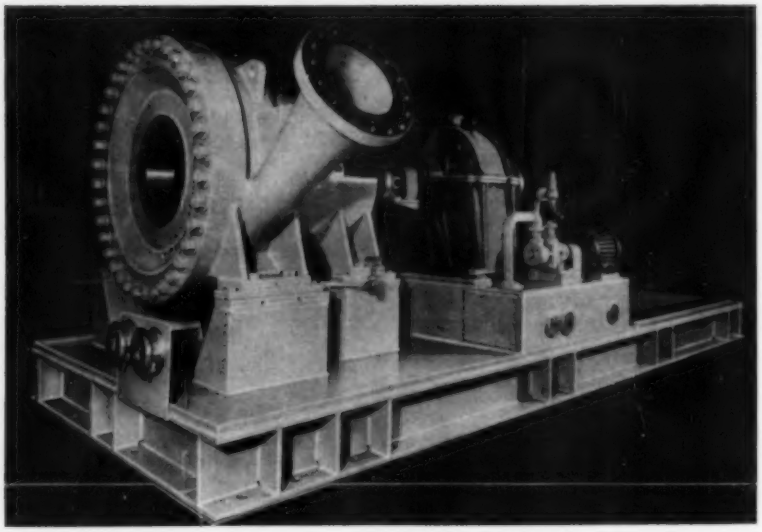
use of 2 check valve blocks which house the suction and discharge checks required for the double action principle. The pump is used for circulating glycol in a closed-system, gas dehydration unit. Power source is wet glycol and a small quantity of gas at absorber pressure.

High-pressure liquid level controllers on the absorber may be eliminated since the pump discharges wet glycol from the absorber. The pump has only 2 moving assemblies with no springs or toggles. The cylinder and piston rod surfaces are hard chrome plated over stainless steel. Series includes pumps having capacities of 40, 90 and 210 gal per hr. *Kimray, Inc.*

Four Lines of Cryogenic Pumps

121 Four complete lines of standardized pumps for handling cryogenic liquids have been announced by Byron Jackson. The pumps are designed for pumping liquid oxygen, nitrogen, methane, and other sub-zero fluids to -320 F and below. The lines — the SM Process, VMT, Hydropress, and Bilton pumps — are adaptations of BJ process pumps made possible by development of a mechanical seal for very low temperature liquids.

The 4 lines of cryogenic pumps include 2 vertical models and 2 horizontal models. Vertical models are the VMT and the Hydropress. The VMT can be built in various numbers of stages, with capacities up to 15,000 gal per min. The Hydropress can be engineered with a minimum of 4 impellers and a maximum of 20 in series for pressures to 2000 psi and capacities to 650 gpm. Horizontal pumps are the SM Process and the Bilton. The SM is built in 1 or 2 stages with discharge pressures to 500 psi and capacities to 5000 gal per min. The Bilton is a self-contained motor-pump usually limited to 60 hp. *Byron Jackson Pumps, Inc.*



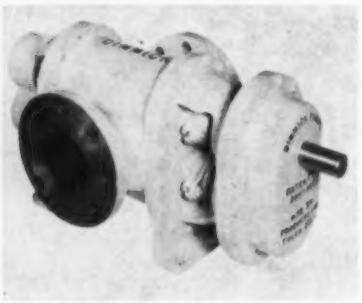
Single-Stage Centrifugal Compressor

122 A single-stage centrifugal compressor built in a barrel-type casing has been installed in a Louisiana refinery to boost 4840 cfm of flue gas from an inlet pressure of 91 psia to a discharge pressure of 135 psia. Recently developed by Allis-Chalmers, the compressor can operate at a working pressure of 500 psig.

Casing of the barrel-type compressor consists of a cylinder, bolted head, and fabricated pedestal. Into the casing is inserted a diaphragm which forms the diffuser passage and the discharge gas passage. Excellent sealing is assured with this design since there is only one shaft extension and one casing joint to seal. The joint is a vertical, metal-to-metal fit positively sealed with a spiral-wound gasket. *Allis-Chalmers Manufacturing Company.*

Positive Displacement Rotary Pump

123 Products, Inc. has announced the new Dimmick 3 in. positive displacement rotary pump. The pump is self-priming, has positive suction and



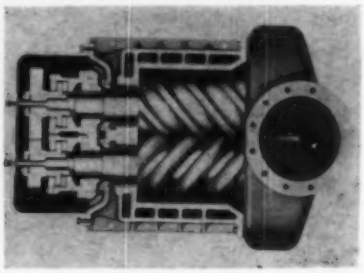
is completely reversible. It can be operated in either direction by reversing the power unit. Relatively light (147 lb), it can pump all liquids from water to high viscosity fluids and abrasives including up to 78 percent solid materials. Castings for the pump are made of Meehanite metal to allow high discharge pressures. The impellers are Neoprene, Hy-Car or natural gum rubber. *Products, Inc.*

Alarm System for Lubricators

124 A low-level and shaft rotation alarm has been designed by Manzel for use on its force-feed lubricators. Purpose of the device is to shut down the compressor in the event the lubricator stops rotating and/or the oil level drops in the reservoir. The unit consists of a small pump, a bleed-down chamber and a pressure switch which is actuated by the pressure in the bleed-down chamber. As long as pressure is maintained, an uninterrupted signal is furnished by the pressure switch. If the pump should not receive oil, or the cam shaft stop rotating, the signal is interrupted. *Manzel Division of Houdaille Industries, Inc.*

New Rotary Compressor Line

125 A new line of positive-displacement rotary compressors has been announced by Fairbanks, Morse & Company. The compressor is a 2-impeller, helical-lobe type, axial-flow, rotary machine with 4-lobe power impeller and a secondary impeller with 6 matching gaps synchronized by timing



gears. As the impellers rotate, the lobes and matching gaps part on the intake and create an intake suction comparable to the suction stroke of a reciprocating piston. Further rotation isolates the interlobal space from the intake and the intermeshing lobes reduce the volume and compress the gas. As the leading edges of the lobes pass the stationary edges of the discharge openings, compressed gas is forced into the discharge line.

In addition to the standard units, compressors with capacities lower than 800 cfm or between 13,000 and 20,000 cfm can be custom-designed. On all constant-speed units, manual or automatic control of capacity can be built in. Compressor can be driven by an induction or synchronous motor, diesel or natural gas engine, or steam or gas turbine. *Fairbanks, Morse & Company.*

Valves, Fittings and Tools

Small-Diameter Pipe Cutter

126 Introduction of a completely portable flame cutting and pipe beveling machine for small-diameter pipe (1½ to 4 in.) has been announced by the H & M Pipe Beveling Machine Company. The small machine is constructed on the same design principles as larger models. The new model "O" is completely portable, weighs 7½ lb, and assures square bevels under all conditions. The machine can be operated easily and efficiently by unskilled operators.

Employing the split-gear horseshoe principle, the unit allows its operator

to place the machine on continuous pieces of pipe. A quick-operating boomer strap speeds up the process of changing the machine from one piece of pipe to another. Any plain-barrel machine cutting torch may be used with the unit which can be adapted to handle imperfect pipe, or special jobs, with special attachments. *H N M Pipe Beveling Machine Company.*

New Line of Forged Steel Gate Valves

127 Newest valves in the Lunkenheimer line are 2 types of forged steel gate valves, one with screw ends and the other with socket welding ends. Each is manufactured in sizes from ½ in. through 2 in. and rated at 800 psi, 850 F and 2000 psi, 100 F. Made of forged carbon steel, they are suited for high pressure, high temperature applications such as hot oil and superheated steam. *Lunkenheimer Company.*

Medium Duty Plug Valve Operators

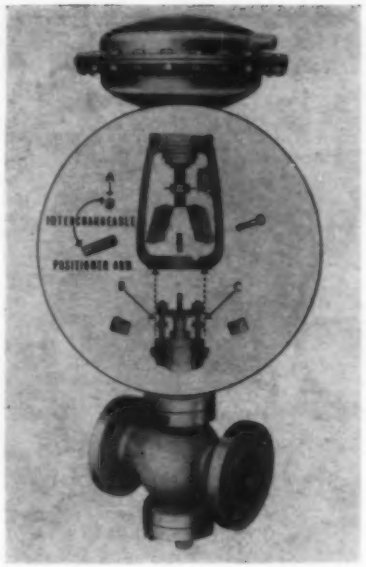
128 Designed for use with air, gas, oil, or water at pressures up to 200 psi is a new line of medium duty plug valve operators offered by Ledeen Manufacturing Company. These valve operators are adaptable to a wide range of control requirements, including process cycling, safety and automatic shut-offs, or any combination of these requirements.

The Model FM is for use on valves requiring relatively low torques. It is a floating bar type operator incorporating 2 single acting cylinders. The Model TM is designed for valves requiring higher torques. This operator utilizes 2 double acting cylinders. The Model QM consists of 2 Model FM or TM operators mounted on a common mounting bracket. In a given size this operator has twice the torque capacity of the same size FM or TM unit.

This line of operators offers a torque range up to 94,000 in.-lb. *Ledeen Manufacturing Company.*

Free Flow Transition Nozzles

129 Tyler-Dawson is manufacturing a new line of forged steel free flow transition nozzles strong enough to withstand over 5 times their rated pressure. The nozzles are furnished with a standard 37½ deg bevel on the top to correspond with the bevel on all welding neck flanges, and a 45 deg bevel on the bottom. Nozzles are seamless forged steel and meet all code requirements. *Tyler-Dawson Supply Company.*



Control Valve Pneumatic Actuator

130 Redesigned Hammel-Dahl diaphragm control valve pneumatic actuators are in full production. New feature of the design is the split-coupling which joins the actuator spring stem to the valve plug stem. The stems do not engage, do not meet. By loosening 3 nuts, the actuator may be lifted over the plug stem. Slotted holding clips and the coupling arrangement allow the actuator to be removed completely without disturbing the packing box bolting.

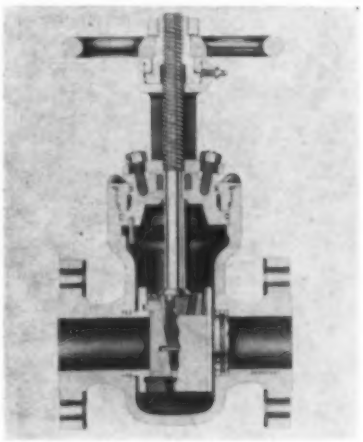
The coupling has left-hand and right-hand threads and acts as a turnbuckle for the adjustment of plug seating tension. The actuators are available in 3 standard sizes, with each size covering 12 different constructions. Three spring ranges — 3 to 15, 5 to 25, and 6 to 30 psi — are interchangeable in each size and type of actuator. *Hammel-Dahl, Division of General Controls Co.*

Non-Lubricated Full Opening Valve

131 Kerotest Manufacturing Company has put into production a new concept in valve design. This is the Keroseal, a non-lubricated, optional-flow, double block and bleed full opening valve. The valve is designed to handle gases, petroleum products, petrochemicals fluids, and numerous other products.

Driven either by handwheel, gear, or motor, the valve is operated by the raising or lowering of the threaded stem. In opening, counter-clockwise turning of the handwheel first withdraws both upstream and downstream discs from contact with the seat rings in the body before raising them out of position, thereby eliminating drag during the opening operation. When closed, Teflon inserts in the discs form a vapor-tight seal.

Keroseal valves available are of carbon steel, flanged ends, in 2-in. through 6-in. sizes, Series 150 and 300 ASA Standards. Standard valves have Hycar "O," rings. Teflon rings are available for special applications. Valves of larger sizes, higher pressure ratings, and alloy steel will shortly be in production. *Kerotest Manufacturing Company.*

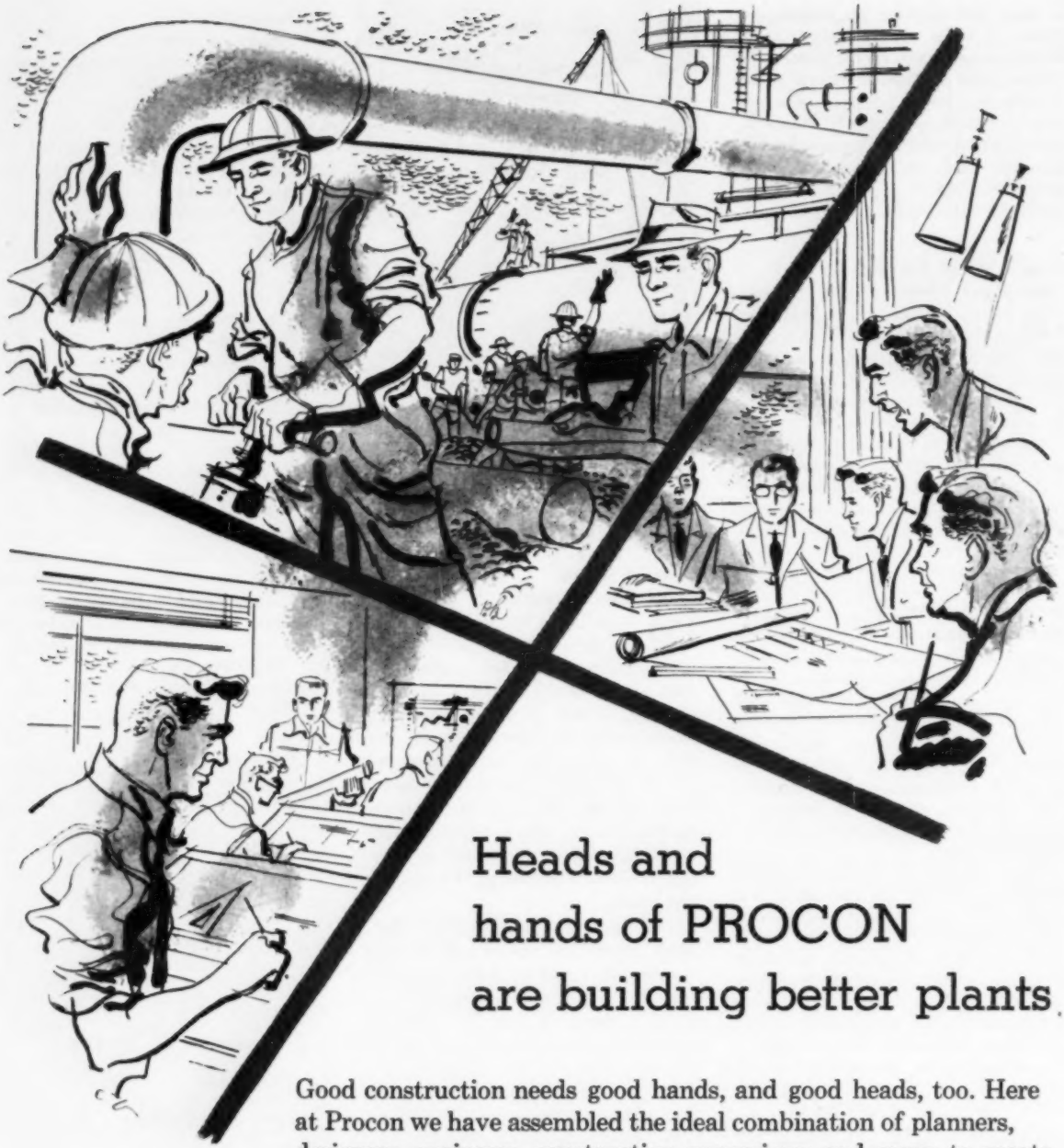


Storage

Storage Vessel Fabricators

132 The J. B. Beaird Company recently furnished some of the world's largest propane storage vessels ever constructed. Ordered by Tellepsen Petro-Chemical Constructors for the Creole Petroleum Company of Venezuela, each of the three tanks had a capacity of 214,400 gal. To facilitate shipment each tank was made in 4 sections, each section being fabricated, X-rayed and stress-relieved before shipment to port. On location the sections were joined to make a tank measuring 256 ft in length, 12 ft in diam and weighing 518,927 lb. Closing seams were X-rayed and stress-relieved in the field.

Beaird regularly fabricates pressure vessels from 65 gal capacity through



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75,000 gal capacity. To facilitate production, Beaird has developed production line X-ray and direct rail connections between fabricating bays and stress relieving furnace which is one of the largest in the South. *J. B. Beaird Company.*

Plastic Cover for Small Vertical Tanks

133 Hammond Iron Works has introduced a rigid foam-plastic floating roof designed to reduce evaporation losses from small diameter, fixed-roof tanks storing volatile liquids. The new cover also affords protection against corrosion. The cover is constructed of rigid polyisocyanate foam in 18 in. radial sections, each of which

is formed in a mold and cured to obtain the required characteristics. Each radial segment of the cover has a flexible foam neoprene seal attached to its periphery. When all segments are assembled the neoprene loop provides an effective edge seal.

It is resistant to all hydrocarbons, water and most chemicals. It will withstand temperatures in the range of -94 to 300 F without detrimental effect. All materials used in the construction of the cover are spark proof and flame resistant. *Hammond Iron Works.*

Tank Level Detector-Controller

134 Industrial Nucleonics announces the AccuRay tank level detector-controller. A major advantage of the unit is that no part of the instrument extends into the tank or vessel. It can be used in either of two modes of operation: (1) Installed so as to provide a relay closure signal when the level rises above or falls below the level of the detector; or (2) Installed so that both a high level and a low level signal can be provided from one instrument. Accuracies are available to ±1/16 in.

A suitable source of radiation is installed either opposite the detector or across the chord of the tank. The source housing is designed to provide shielding so as to reduce the external radiation field well below acceptable tolerances. The radiation field required at the detectors for operation is quite low — only 0.2 milliroentgen per hr. Circuitry prevents chatter from radiation statistics and has been simplified to eliminate vacuum tubes, transistors, and other amplifying devices. The instrument is available in explosion-proof packaging. *Industrial Nucleonics Corporation.*

Electronic Tank Gage

135 An improved model of the Gilbarco electronic tank gage has been announced. The new gage, housed in one small explosion-proof housing, weighs 120 lb less and is installed with 2½-in. standpipe. The model has been designed to gage liquid levels in pressure tanks up to 250 psi as well as atmospheric vessels.

A modification of the model is also available with a special sensing element for continual measurement of the interface of petroleum product and water. Temperature range has been increased to handle products to 175 F, and with minor modifications, product temperatures can be measured up to 425 F. The gage is accurate to within ± 1/16 in., and continuous readings of liquid levels in feet, inches, and sixteenths can be taken at the tank site, as well as remotely if desired. *Gilbert & Barker Manufacturing Company.*

THREAD LEAK REPAIR
—QUICK, FINAL!

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.

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THAT WILL WITHSTAND
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LONG LIFE
Sheath Diameters .04 to .32
Thermocouple Lengths to 50 feet
Complete Thermocouples made to every requirement

NEW, SIMPLE CONSTRUCTION
Made from metal sheath over ceramic insulated thermocouple wire.
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- Safety design seals against escaping gases.
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- Distinct, accurate level shown in red contrasted with silver above.
- Job designed, correlating pressure, temperature, and specific gravity.
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For fast, shockless loading the Wheaton Type 680 Loader is in a class by itself. When loading, it remains in the tank manhole without having to be held down. When loading is completed, pre-set springs carry the assembly to any angle from 10° to vertical.

Noted for long wear and easy maintenance, Type 680 is the most economical loader you can install. All swing joint seals are easy to replace without breaking any threaded connection. 2", 2½", 3", 4" and 6" sizes in bronze, aluminum, steel and stainless steel.

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Other Equipment

Hydraulic Crane Speeds Close Lifting

136 Heavy lifting up to 5 tons in close quarters where equipment is crowded and access is difficult is a specialty of the mobile A-W hydraulic crane. It is equipped with a single 18-ft boom to which a 12-ft extension can be added. To stabilize the 30-ft fully extended boom, four hydraulic outriggers are used. This live boom hydraulically extends or contracts or rotates through 270 deg while lifting or lowering at the same time. It is mounted on a heavy-duty frame and powered from the rear by a 6-cylinder engine. The crane's 16-in. tires with 4-wheel power steering and 4-wheel drive makes it maneuverable in extremely close quarters. Hydraulic controls permit precise lifting operations from the wide visibility cab at the front of the unit. The engine is equipped with an hour-meter and the crane has 6-speed transmission and torque converter as well as a special 60-gal per min hydraulic pump. *Austin-Western Construction Equipment Division, Baldwin-Lima-Hamilton Corporation.*

Unit Controls Radiator Shutters

137 A thermostatic powered unit for operating radiator shutters on engines, the new Dunlap thermomotor control is a self-powered, modulating unit. Instead of operating shutters in a fully open or closed position, the thermomotor opens shutters to the desired position for maintaining a constant coolant temperature, plus or minus one degree. The unit delivers 86 lb of force with 1¾ in. travel of a 3-in. lever arm. It is not affected by vibrations and has a corrosion resistant aluminum housing. Easily installed, the thermomotor requires only coolant intake and discharge connections and, is available in a variety of temperature ranges. *Dunlap Manufacturing Company.*

RUGGED H_2 INDICATOR for catalytic reformers

Works on a simple, mechanical principle using specific gravity to measure H_2 in reformer recycle gas. Low cost. Instant response. Local or remote readings. Replaces expensive, delicate instruments that "can't take it."

Other uses: Measuring specific gravity of refinery fuel gas, off-gases from cracking furnaces, demethanizers, etc. and for gas blending . . . also analyzing boiler and heater flue gases to cut fuel costs.

• • •

Write for Technical Bulletin RD-101, The Permutit Company, a division of Pfaudler Permutit Inc., Dept. OE-7, 50 West 44th St., New York 36, New York.

RANAREX®

Automatic Refinery Pilot Plant

138 A computer-controlled pilot plant designed to save scientific manpower and speed development of new refining processes is being built by the Systems Division of Consolidated Electrodynamics in cooperation with the Esso Research and Engineering Company. The new automatic unit will be applied to an intermediate size pilot plant used for many small scale process evaluations. The unit is being designed so that after the introduction of a previously prepared catalyst cartridge into the reactor section, an automatic program system will take over and conduct an entire catalyst evaluation program.

The program will include an automatic pressure test for leaks, oil cycle, regeneration cycle, catalyst treating cycle, and finally a shutdown after a specified number of complete cycles. Temperatures, pressures, and gas and liquid stream compositions will be monitored, controlled, and in certain cases, logged. The product recovery system will be designed to make an efficient C_4-C_5 split, common to most pilot plant operations. *Consolidated Electrodynamics Corporation.*

Chemical Removes Cause of Corrosion

139 A liquid chemical concentrate, Cronox C conditioner, is injected into desalted feed-stock in conjunction with soda ash and water. Within the crude unit, fouling and corrosive agents are removed from the hydrocarbon stream without affecting existing processes, equipment, catalysts, or products. Conditioning treatment rids crude of impurities through its ability to scavenge oxygen and neutralize acids. Protection is afforded the crude unit itself and the purified hydrocarbons are less capable of causing fouling or corrosion in units downstream.

No control procedures or processing equipment are necessary in order to use the conditioner. Feed system for injecting conditioning solution is built from equipment refineries normally have on hand. *Atlas Powder Company.*

Pressure Switches for Corrosive Service

140 A new line of Meletron pressure switches has been developed by Barksdale Valves. They are available in materials suitable for use with concentrated hydrogen peroxide, fuming nitric acid, liquid oxygen, proprietary amine fuels, fluorine, mixtures of fluorine and liquid oxygen and others. Proof pressure range from 224 to 6000 psi, pressure settings from 2 to 4800 psi. Switches will operate in temperatures from −65 F to +275 F.

The housing serves as a pressure-tight safety capsule in case of a break in the sensing element. Single-pole double-throw switching elements are rated to 10 amps for a-c and d-c circuits. *Barksdale Valves.*

Ratio-Recording Flow Colorimeter

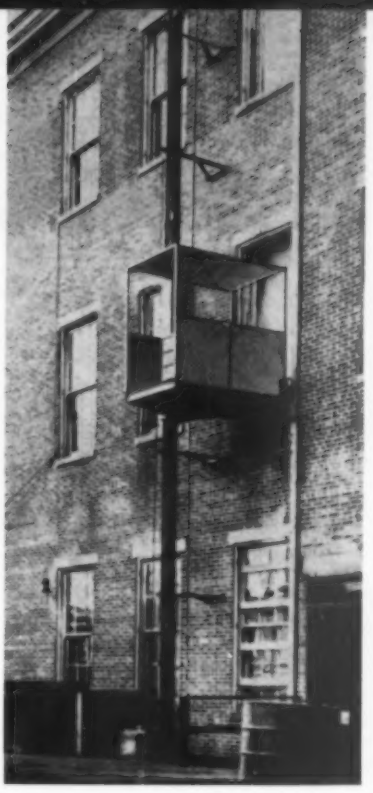
141 A new ratio recording flow colorimeter for continuous analysis of any color in the visible spectrum is announced by Beckman.

The ratio-recorder makes possible measurement of wave lengths of color ranging from 350 to 1000 millimicrons in the presence of turbidity or entrained gas. This is made possible through the use of a light beam splitter which is based on the principle of a single beam instrument. It is relatively insensitive to source variations and to the accumulation of foreign matter on the cell windows of the analyzer section. The unit is available in a wide variety of conventional colorimeter path lengths. *Beckman/Process Instruments Division.*

Dissolved Oxygen Analyzer

142 Beckman/Process Instruments Division announces its Model 70 dissolved oxygen analyzer which measures dissolved oxygen in high purity water, detecting minute traces as low as one part per billion. Instrument design is based upon a rapid and irreversible chemical reaction specific for dissolved oxygen. The instrument operates on 115 v, 50/60 cycles. Ranges include 0-25, 0-50, 0-250 parts per billion plus a 10-fold extended range with the upper portion of the scale compressed for leak tracing during boiler start-up. Signal output is 0-5 millivolts which can be fed to standard potentiometric recorders.

Instrument specifications include: time for 90 percent response approximately 2 minutes from time sample enters analyzer, accuracy to ± 5 percent of reading, calibration and zero stability to within 1 part per billion for periods of weeks, ambient temperature range 50-110 F, sample pressure 5-20 psig, sample temperature up to 100 F. *Beckman/Process Instruments Division.*



Transportable Elevator Lifts One Ton

143 A transport elevator for use in the petroleum and other heavy industries is introduced by Hawkeye Products Corp. Said to be the only demountable personnel elevator meeting all safety regulations, it can be transferred from one job to another in less than a day. The car travels on a single vertical monorail and lifts workmen or materials up to 250 ft, carrying 8 men or one ton of materials. The elevator is suitable for temporary or continuous service and requires no shaftway. *Hawkeye Products Corporation.*

Sight Flow Indicators

144 Sight flow indicators manufactured by Wm. W. Nugent & Company are used to indicate the flow of liquid in a pipeline and may be installed horizontally, vertically, diagonally or upside down. One model of the indicator has a spring-compensated, hinged indicator gate which moves in proportion to the flow and fits close to the inside of each sight window on both sides of the fitting which makes it visible even though the liquid is dark. The fitting may be supplied with electrical contacts to operate an alarm should the liquid flow stop.

Indicators are furnished in standard pipe sizes, tapped or flanged connections. Fittings furnished for 125 psi working pressure are in iron, brass, or steel. *Wm. W. Nugent & Company, Inc.*

Jacketed Spring Loaded PLUG VALVES

- 2-WAY OR STRAIGHT SPRING LOADED
- 3-WAY SPRING LOADED
- ANGLE SPRING LOADED
- AIR CYLINDER OPERATED SPRING LOADED—*all sizes and types*

LONG ON SERVICE . . . SHORT ON MAINTENANCE

H & B's new fully jacketed spring loaded plug valves feature an inverted tapered plug inserted and lapped into the housing from the bottom of the valve—then spring loaded. The spring wedges the plug to a perfectly tight seal, eliminating troublesome leaks. Easy to operate—no big handwheel . . . no freeze . . . no "breaking loose" necessary. Easy to clean. Made in two port or multi port design, with any special stop arrangement desired.

Bulletin J-57 sent on request

HETHERINGTON & BERNER INC., 711 Kentucky Ave., Indianapolis 7, Ind.

Pipe Insulation Has Built-In Tie Wires

145 A new blanket-type, mineral wool pipe insulation is announced by the Baldwin-Hill Company. Featuring built-in tie wires, it combines the application ease of sectional molded pipe coverings with the thermal efficiency and temperature range of conventional blanket-type pipe insulations.

Manufactured from spun mineral wool, the new material has an outer surface faced with a metal fabric of 16-gage wires welded in a 2 by 2 5/6-in. rectangular metal mesh. Seven wires, which extend from one end of the rectangular mesh, act as tie wires. Hooked under the stay wire at the opposite end of the mesh fabric, they hold the material around the pipe. The insulation will withstand temperatures to 1200 F and is available in sections 2 ft long and 1½ to 4 in. thick. It is designed to insulate pipes from 4 to 30 in. in diameter. *Baldwin-Hill Company.*

NEW Transistorized PENETRON

This highly efficient instrument answers the demand for a low-cost, lightweight tool (total weight 5½ pounds) designed to check pipe-wall thickness. The PENETRON M-4 is powered by easy-to-get batteries, permanently calibrated for easy readings and needs little or no maintenance.

- ★ **Highly Accurate . . . ± 3% of wall thickness.**
- ★ **Temperature Compensated Stable Circuit using Transistors.**
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- ★ **Available for Pipe Sizes of: 2"8", 2"-12" and 6"-24" O.D.**

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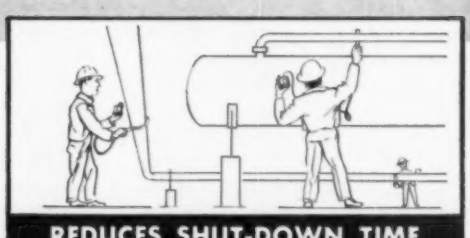
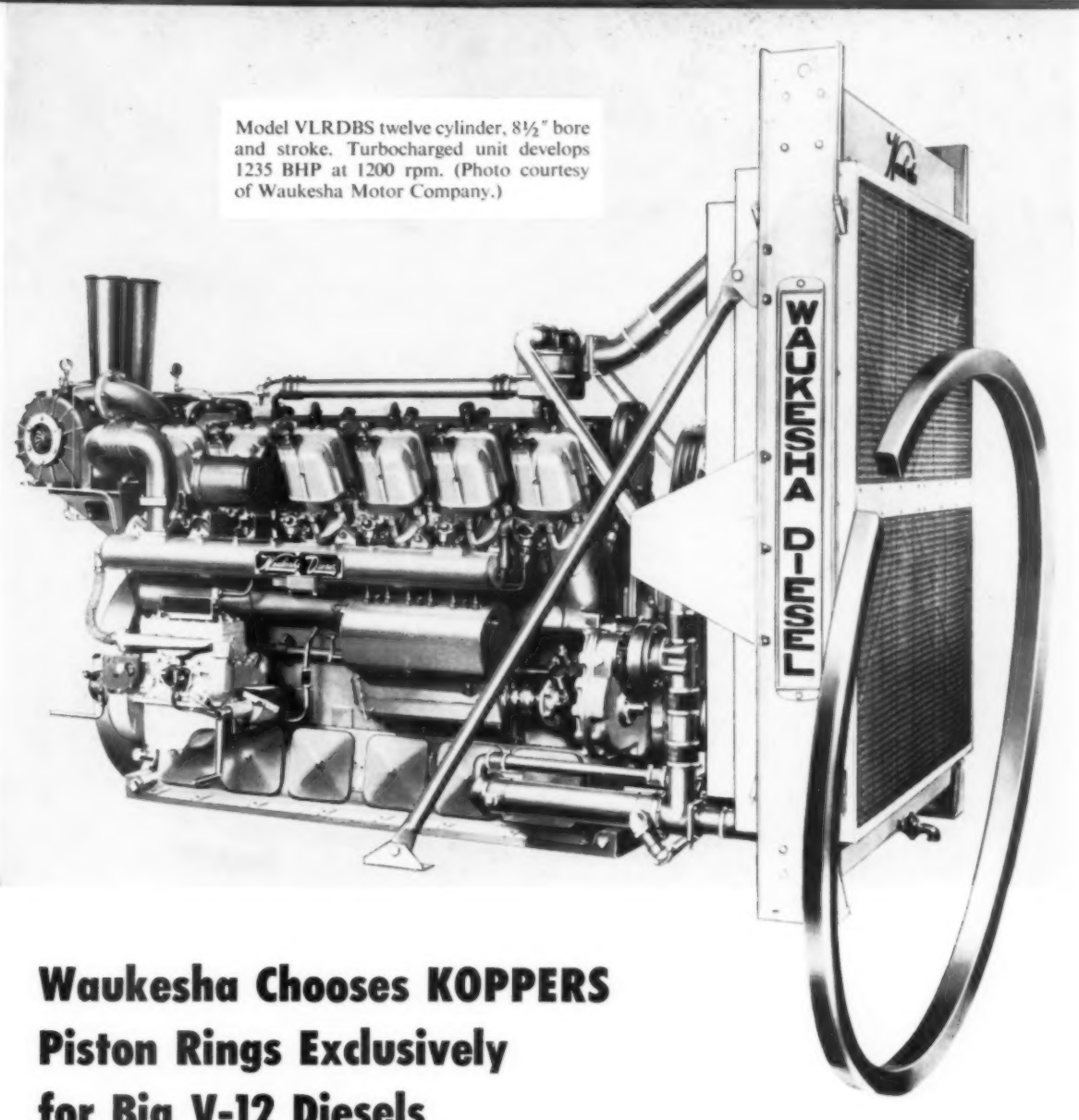
Model 4 for 2" to 8" pipe
$750.00



REDUCES SHUT-DOWN TIME

SPEEDS SPOT CHECKS

UNITED Engineers INC.
824 E. Sixth St. Tulsa, Okla.
Pioneers of Gamma-Ray Inspection Instruments



Model VLRDBS twelve cylinder, 8½" bore and stroke. Turbocharged unit develops 1235 BHP at 1200 rpm. (Photo courtesy of Waukesha Motor Company.)

Waukesha Chooses KOPPERS Piston Rings Exclusively for Big V-12 Diesels

Waukesha's VLRDBS supercharged diesels are perfectly suited for applications such as oil rigs, excavators and tugboats where a surge of reserve power is essential for emergency and overload demands.

This recent series of diesels manufactured by the Waukesha Motor Company, of Waukesha, Wisconsin, is designed to develop tremendous power under the severest operating conditions . . . the kind of power that puts a premium on piston ring performance. Waukesha has selected Koppers Piston Rings as have other manufacturers who must be certain of reliable component performance.

This dependability is yours when you rely on Koppers with their complete range of materials . . . wide selection of types and sizes . . . rigid quality control and careful inspection. These factors contribute to Koppers unchallenged leadership in producing the finest piston and sealing rings for industry.

Instead of undergoing needless expense in solving ring problems, take advantage of Koppers experience, research facilities and craftsmanship. Write for information today. KOPPERS COMPANY, INC., Piston Ring and Seal Dept., 1715 Hamburg St., Baltimore 3, Md.

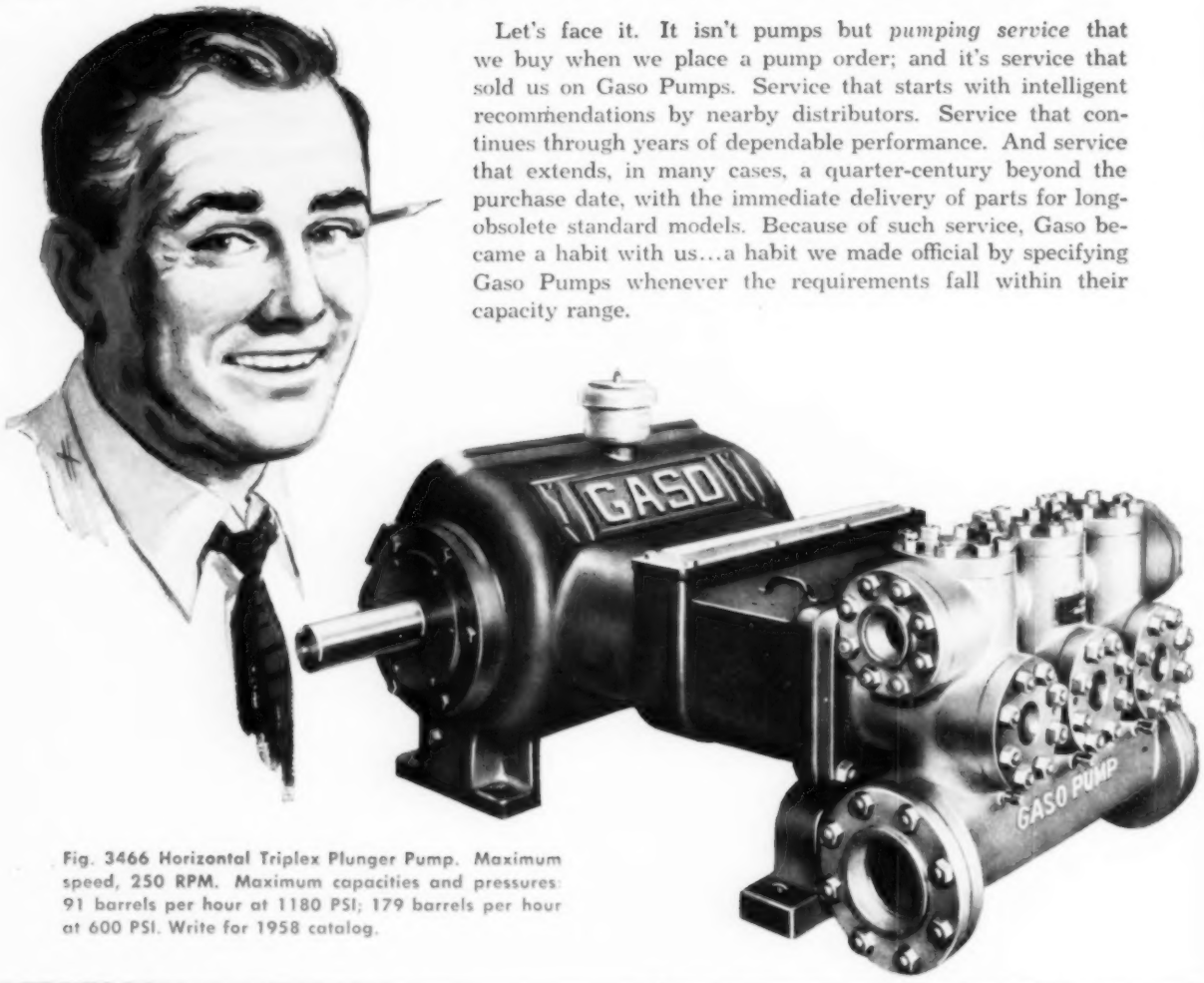
★ **KOPPERS DEPENDABLE RINGS CONTRIBUTE TO WAUKESHA'S RELIABLE PERFORMANCE UNDER THE MOST RUGGED CONDITIONS.**

KOPPERS

AMERICAN HAMMERED
Industrial Piston Rings
Engineered Products Sold with ***Service***

We're Guided By Service As Well As Performance

IN STANDARDIZING ON GASO PUMPS



Let's face it. It isn't pumps but *pumping service* that we buy when we place a pump order; and it's service that sold us on Gaso Pumps. Service that starts with intelligent recommendations by nearby distributors. Service that continues through years of dependable performance. And service that extends, in many cases, a quarter-century beyond the purchase date, with the immediate delivery of parts for long-obsolete standard models. Because of such service, Gaso became a habit with us...a habit we made official by specifying Gaso Pumps whenever the requirements fall within their capacity range.

Fig. 3466 Horizontal Triplex Plunger Pump. Maximum speed, 250 RPM. Maximum capacities and pressures: 91 barrels per hour at 1180 PSI; 179 barrels per hour at 600 PSI. Write for 1958 catalog.

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GASO PUMP & BURNER MFG. CO.
TULSA, OKLAHOMA
Export Office: 149 BROADWAY, NEW YORK

GASO PUMPS
for every oil industry need

SPECIAL DESIGN PORTABLE METER CALIBRATING TANKS

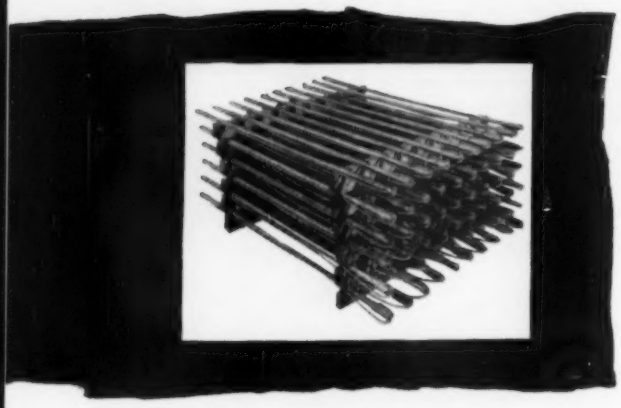
Tanks shown are part of a shipment to a major oil company's terminals in the Midwest. These tanks are specially designed with triangular frame and caster wheels so they can be moved easily by one man in the terminal loading rack area. Warner Lewis Company welcomes the opportunity to submit designs to meet **your** special requirements. Write for complete information.

DIVISION OF FRAM CORPORATION

Representatives in all major cities
In Canada: FRAM CANADA LTD., Stratford, Ontario

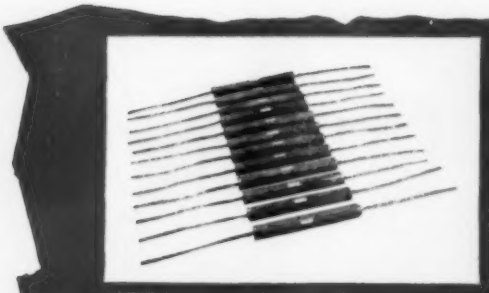
WARNER LEWIS COMPANY
BOX 3096 • TULSA, OKLAHOMA

When Duriron was first introduced as a cathodic protection medium, performance data reported was necessarily that of simulated field conditions in the laboratory. Now, with installations numbering more than 55,000 anodes, we can report qualitatively on Duriron in various ground bed, fresh water or salt water conditions.



Qualitative reports available on DURIRON® in cathodic protection service

Many of these reports are available now. More are currently in preparation for early release. If you feel that your present method of protection could be improved, we urge you to let us send you these reports as they become available.



THE DURIRON COMPANY, INC.
Dayton, Ohio

DURIRON® anodes

The Duriron Company, Inc., Dayton, Ohio, Dept. P.R.

PLEASE SEND REPORTS ON DURIRON ANODE INSTALLATIONS.

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10 ways to protect the quality of your petroleum products

THE UOP FAMILY OF SUPERIOR ADDITIVES AND INHIBITORS SERVING THE PETROLEUM INDUSTRY

PRODUCT	APPLICATION
UOP NO. 1* Inhibitor, a phenolic fraction obtained from wood distillation.	Most economical way of obtaining antioxidant units.
UOP NO. 4* Inhibitor, a substituted aminophenol.	Protects unstable gasolines; potent for reducing copper dish gum.
UOP NO. 5* Inhibitor, N, N'-di-secondary butyl-p-phenylene-diamine.	Prevents gum formation and stabilizes tetraethyl lead; catalyzes air oxidation of mercaptans.
UOP NO. 5S* Inhibitor, phenylene-diamine type antioxidant.	Similar to No. 5 but catalyzes sweetening at a sharply increased rate.
UOP NO. 7* Inhibitor, crystalline dibutyl para cresol.	Inhibitor for relatively stable gasolines; stabilizes lead, insoluble in acid or alkaline tank bottoms.
UOP NO. S-7* a 33⅓% solution of UOP No. 7 in toluene.	Improved convenient form of No. 7 for liquid injection into gasoline.
COPPER DEACTIVATORS Regular Grade—80% active ingredient. AW* (50) Grade—50% active ingredient.	Prevents traces of copper from interfering with the action of the above inhibitors. Synergist for fuel oil inhibitors and dispersants.
UNICOR® ash-free, low nitrogen, oil-soluble corrosion inhibitor.	Protects refinery equipment, storage tanks and pipe lines from corrosion. Active over wide pH range.
UNICOR® LHS anti-icer and corrosion inhibitor.	When added to gasoline it eliminates stalling caused by carburetor ice. An excellent corrosion inhibitor for all distillate streams; particularly useful in liquid propane and butane.
POLYFLO* 100 an all-organic inhibitor-dispersant.	For all fuels and diesel oils: 1) To improve jet fuel thermal stability. 2) To stabilize No. 2 heating oils and diesel fuels against color deterioration and sludge deposition. 3) To eliminate fouling in feed exchangers and reboilers. 4) To eliminate tank bottoms in crude and residual oil storage tanks.

You're always sure of best quality, best performance when the additives and inhibitors you use are labelled "UOP"

*Trade Mark

UNIVERSAL OIL PRODUCTS COMPANY
30 Algonquin Road, Des Plaines, Illinois, U.S.A.

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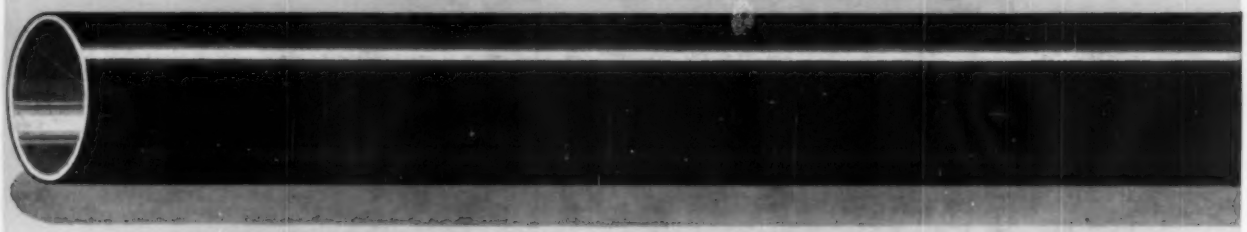
BARRETT PIPE COATING MATERIALS



BARRETT PIPELINE PRIMERS

Fast-drying primers formulated to meet conditions normal to construction months. Always secure the maximum bond of the enamel to the pipe. In 55-gallon, non-returnable steel drums and 5-gallon pails.

- ☐ **"BARRETT #1190" Primer** ("Barrett" Pipeline Primer)—Constant quality service that keeps bond at interfaces of steel, primer, and enamel. Normal drying time six hours.
- ☐ **"BARRETT #1111" Primer** ("Barrett" Quick Drying Primer)—Especially adapted to be applied in cold weather. Use only with semi- and fully-plasticized enamels.
- ☐ **"BARRETT #1300, #1400, #1500, #1600, #1700" Primers** ("Barrett" Plasticized Primers) — Plasticized primers applied at low temperatures or at plants where temperature is controlled by ovens.

BARRETT PIPELINE ENAMELS

Outstanding service records tell you that Barrett Enamels offer positively dependable and lasting protection. Easy-flowing coal-tar bases let you apply Barrett Enamels in less time and still be certain of a maximum bond.

- ☐ **"BARRETT #1180, #1190 & #1200" Enamels** ("Barrett" Pipeline Enamels) — The original Barrett Enamels. Highly resistant to soil stress effects. High in electrical insulating value! Non-absorptive, economical. Time-tested!
- ☐ **"BARRETT #1300" Enamel** ("Barrett" Millwrap Enamel) — Particularly suited for pipe in distribution systems, gathering and recycling work, mine supply and plumbers' supply, as well as dealers' stock. Supplied in metal drums weighing approximately 600 pounds each.
- ☐ **"BARRETT #1500" Enamel** ("Barrett" AA Enamel)—The all-year enamel! Plasticized enamel for external use only.
- ☐ **"BARRETT #1000" Flux** — Use with narrow-range enamels when atmospheric temperatures are low and the coated pipe is exposed above ground. Used correctly, flux will prevent checking of enamel.
- ☐ **"BARRETT #1660" Coupling Compound** ("Barrett" Waterworks Coupling Compound) — Plasticized material with plenty of flexibility. Withstands movement of pipe at couplings during lowering and after burial — without cracking!
- ☐ **"BARRETT #1700" Enamel** ("Barrett" Hotline Enamel)—A special, fully plasticized enamel having extremely high resistance to high temperatures and soil stress. Has in service temperature range from 0° to 200° F. It will not slide or move off pipe at 200° F., under actual conditions found in underground service. It is an ideal coating where operating temperatures of the lines are high, or for lines in soil exhibiting high soil stress, and in places where there is rough, stony backfill.

PROVED AND IMPROVED FOR THREE GENERATIONS

You will find Barrett protective products for your every need! Full-time corrosion controls made to protect your pipeline investments. When new corrosion problems appear, expect to see a new Barrett protective product designed to help you take corrosion risks out of your operation.

Now Barrett assigns new numbers to pipe coating materials – to help you keep up with the growing Barrett product family. Of course, you will receive the same dependable coating materials made from highest quality, refined coal-tar pitch bases! The same superlative corrosion controls that always shield your pipeline investments!

Check the Barrett Pipeline Coating Materials you need! After you order, put this page in your top desk drawer for quick reference.

BARRETT AUXILIARY PROTECTIVE SERVICE MATERIALS

☐ **"BARRETT #1990" Pipeline Felt** (Asbestos Felt)–Weighs approximately 15 pounds per 100 square feet. Impregnated with high-quality coal-tar saturant and bonds intimately with enamel. Unsurpassed shield against soil stress effects!

☐ **"BARRETT #1980" Pipeline Felt** (Light Weight Asbestos Felt)–Weighs approximately 8 pounds per 100 square feet. Impregnated with high-quality coal-tar saturant and glass-reinforced.

☐ **"BARRETT" Asbestos Pipeline Felts,** plain or perforated, standard weight (regular or glass-reinforced), and glass-reinforced lightweight provide a protective membrane of coal-tar saturated asbestos that cannot rot or decay as a wrapper, shield, and reinforcement. They act as an enduring barrier to shield the pipeline enamels from earth loads and soil stress. They bond readily to all coal-tar enamels to provide an inorganic permanent shield and effectively assure economical, long-term protection against corrosion, mechanical or impact shocks, etc.

☐ **"BARRETT #161" Pipe Fabric** ("Barrett" Pipeline Fabric) – A strong, woven cotton cord fabric thoroughly saturated with high-grade coal-tar pitch. Tough, durable, flexible! Individual rolls 300 feet long.

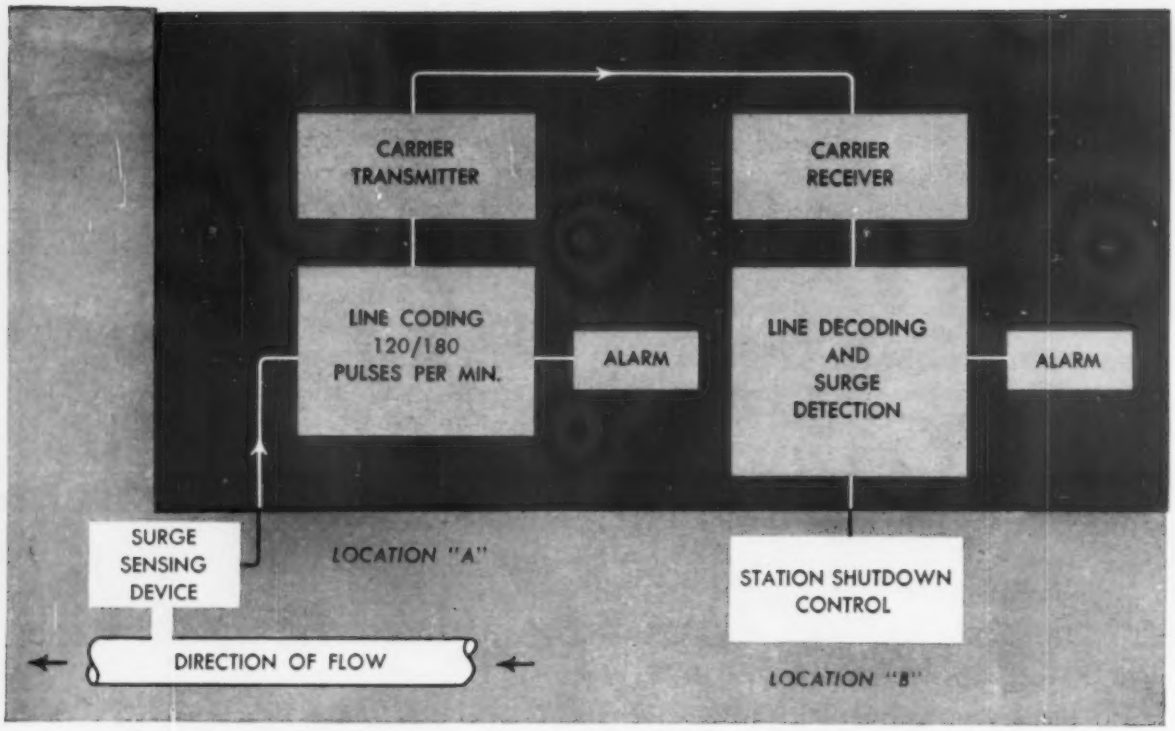
☐ **"BARRETT #160" Series Mastics** ("Barrett" Service Cements) – High-grade, coal-tar pitch base, plastic materials for cold application and service work.

Order or specify to the yard-coating applicator the Barrett Pipe Coating Materials that you need to combat corrosion! You can't afford to speculate on protection. Buy Barrett!

BARRETT PROTECTIVE COATINGS

Barrett Division, Allied Chemical Corporation,
40 Rector Street, New York 6, N. Y.

Allied Chemical



New! Union Surge-Purger

protects your pipeline from blowouts

PIPELINES ARE GETTING OLDER. Pumping stations are steadily being added to increase capacity. As a result, stresses on pipeline systems are becoming acute and blowout protection is needed. Union Switch & Signal has the answer—a new protection system that automatically detects surges and acts to stop them.

AUTOMATIC SHUTDOWN

The schematic diagram of the Union Surge-Purger Control System is shown above. Normally the equipment at Location B receives a steady 120-cycle code.

A severe surge causes this code to change to a 180-cycle "shutdown" code. The station shutdown equipment responds *only* to this special shutdown code, immediately acts to shut down the pump upstream from the point where the surge was detected.

If the "normal" 120-cycle code is upset by noise or equipment failure, an alarm indicates this situation. But only a surge can cause a shutdown.

SIMPLE AND RELIABLE

Practically no maintenance is required by this rugged all-relay control system. It will operate reliably for extremely long periods of time. Its dependability and self-monitoring features make it as foolproof as any control can be. This system is working to the complete satisfaction of leading pipeline companies in surge detection problems. Write to learn how it can help you.

"Pioneers in Push-Button Science"

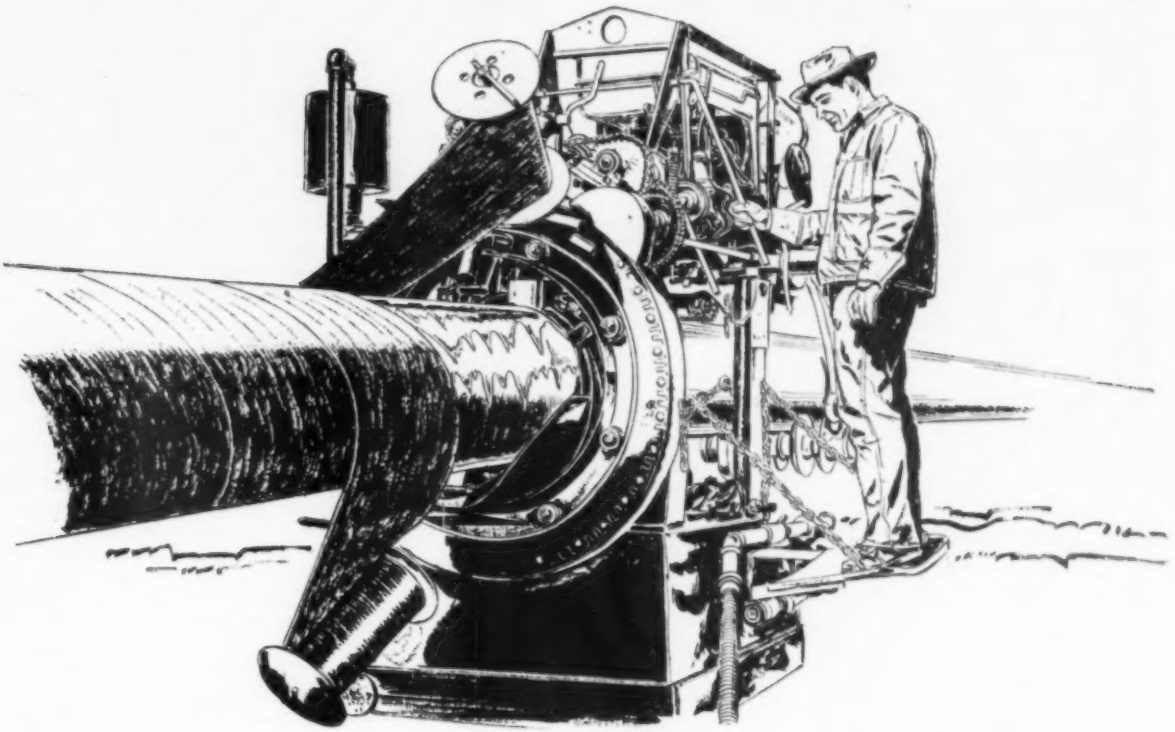
UNION SWITCH & SIGNAL

DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY

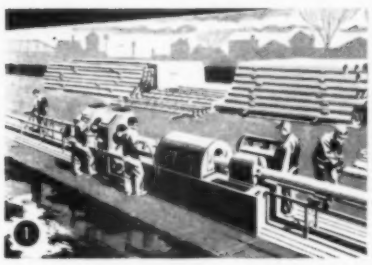
PITTSBURGH 18, PENNSYLVANIA

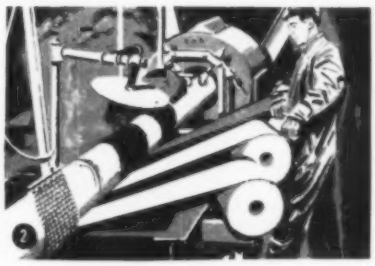
FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

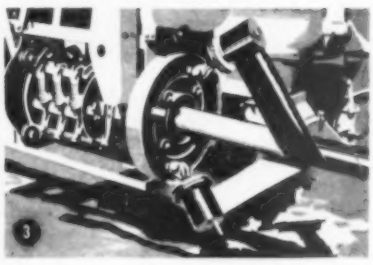
no one coating is best for every job



that's why Dearborn supplies all three







Varying circumstances, job conditions, and even budget limitations prohibit specifying one type of coating for every pipeline. That's why Dearborn offers you all three: asphalt coatings; wax-type coatings; polyethylene plastic tape. These superior coatings, together with the correct primers and wrappers, may be applied at the mill, railhead, by hand or Traveliner. Your local Dearborn representative can help you select the right coating combination for your specific job at lowest possible cost.

CALL YOUR DEARBORN MAN OR WRITE FOR INFORMATION

1. Asphalt Coatings. Write for your copy of Bulletin 3083-A.
2. Wax-Type Coatings. Write for your copy of Bulletin 3050.
3. F.O.S. SAFE-T-CLAD Polyethylene Plastic Tape. Write for Bulletin 3002.

Dearborn® CHEMICAL COMPANY

MERCHANDISE MART PLAZA, CHICAGO 54, ILLINOIS

WORLD'S MOST COMPLETE LINE OF PROTECTIVE MATERIALS FOR THE CONTROL OF CORROSION

Look into PARSONS® Trenchliners® for pipeliners

For opening any size trench — from largest cross-country transmission lines to small feeder lines, laterals, gathering systems, there's a size Parsons Trenchliner to fit your exact requirement. With 10 different models to choose from, big Parsons line offers: *5 wheel-type* Trenchliners digging 12 to 52 inches wide, at depths to 8½ feet — *5 ladder-type* Parsons Trenchliners digging 6 to 72 inches wide, at depths to 19 feet.

Here's a good, small wheel-type Trenchliner, in the popular low-price range, that digs up to 18 lineal feet of trench per minute, 12 to 24 inches wide at depths to 5¾ feet. Hydraulic power raises and lowers the wheel on vertical mast with fractional-inch accuracy — and tilts the mast for traveling or trailer-loading. A shiftable, reversible belt conveyor gives controlled discharge (hydraulic conveyor drive optional). This low-cost 130 also has cast-steel buckets with self-sharpening, reversible "Tap-In" teeth, quick-change gumbo buckets, retractable bucket-cleaner, etc. It's heavy-duty, high-quality in every detail.

Look at the work range of this medium-size 170 Trenchliner, with its extra-wide wheel-frame. You get trench widths from 20 to 32 inches — depths to 5¾ feet — digging speeds up to 25 lineal feet per minute. Hydraulic control on conveyor gives belt speeds up to 600 feet per minute — *completely independent of digging wheel speeds.* Belt easily handles maximum yardages from the extra-wide wheel. Want more facts? See Parsons distributor — or send coupon.

Mail to: PARSONS COMPANY, Newton, Iowa

Send us literature on: ☐ 130 ☐ 170 *Trenchliner*

NAME_____

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PS19 PE

PARSONS COMPANY, Newton, Iowa *(A division of Koehring Co.)*

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Stop damage to enamels from earth loads and soil movement . . .

Johns-Manville Asbestos Wraps are available in 3 types for field application or mill wrapping.

Soil stress tests show the effective shielding action of J-M Asbestos Wraps. 18" coated sections of 4" O.D. pipe were buried in bentonite clay which was first wetted down and then allowed to dry out. At the end of 28 wetting-drying cycles, J-M Asbestos Wraps were found to give excellent protection to the enamel.

Plasticized enamel without J-M Asbestos Wrap ←

→ **Plasticized enamel after protection with J-M Asbestos Wrap**

Get lasting protection with tough, strong J-M Asbestos Wraps

Extensive research and field tests conducted by a leading firm of consulting engineers have demonstrated the effects of soil movement and earth loads on pipeline enamels. They show how the forces of the soil tend to distort and induce thin spots that weaken the protective coating . . . permit corrosion of the pipeline.

The same research and field tests also demonstrated that J-M Asbestos Wraps provide the strong protection that strong coatings need and deserve. "Asbestos Wraps offer the most effective single protection against damage —prolong the working life of pipeline enamels." Here's why . . .

Asbestos is an ageless mineral. Fibers of asbestos are strong and tough . . . cannot rot or decay. As used in J-M Wraps, the fibers are felted, then impregnated with a coal tar or asphalt saturant to form literally a flexible covering of stone. These "stone-like" qualities form a durable shield—protect pipeline enamels from earth loads and soil movement which weaken coatings and permit pipe corrosion to set in.

Pipeline engineers are invited to write for their own copy of PP-34A, a *3-Point Study of Pipeline Coatings and Wrappers*, at no cost or obligation.

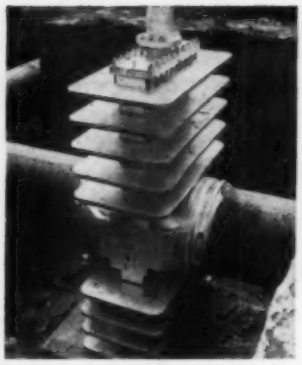
Johns-Manville, Box 14, New York 16, N. Y.
In Canada, Port Credit, Ontario

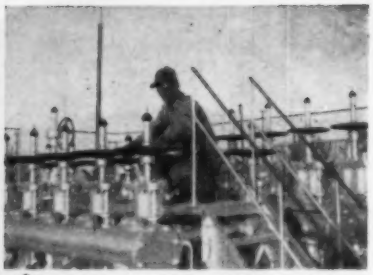
JOHNS-MANVILLE

JOHNS-MANVILLE PRODUCTS

Perfect through-conduit alignment simplifies hot tapping through this 22" ASA 600 valve.

34" full opening high pressure gas valve will stay bubble-tight underground—with no lubrication or maintenance.





Ease of operation is of prime importance on frequently used manifold installations.

PERFORMANCE in the field points up the BIG DIFFERENCE

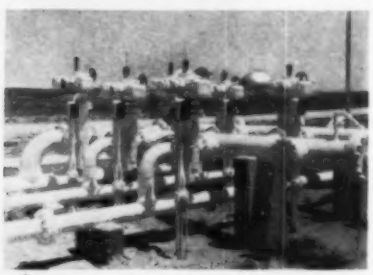
—in bubble-tight seal you can check in the line
—in easier operation with no wedging or jamming
—in lower maintenance with no need for lubrication
— in through-conduit always in line with the line

Thousands of pipeline, manifold and storage installations in gas and liquid services are daily adding to the record of performance that makes Grove *Seal-O-Ring* Gate Valves stand out as the practical answer to operating problems. If you have any doubt, ask men who are using them. It will pay you to specify Grove *Seal-O-Ring* Valves with the fabricated steel body—2" to 36"—in any standard pressure. Call your Grove representative or write today for details.

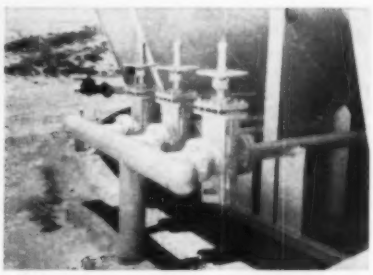
THE WHOLE VALVE IS RIGHT HERE

When valve is full open or closed, bubble-tight seals on both sides of the gate completely isolate line pressure in the conduit. The body, serving merely as framework for operating mechanism and to prevent loss of product while gate is in motion, may be drained or vented to atmosphere when gate is open or closed. Integrity of seals can be checked any time by a tell-tale valve on the body.

703



Products manifold at pipeline station illustrates typical motor-operated *Seal-O-Ring* Valve application.



LPG tank-to-pipeline is critical service where it's well to be able to check seal in the line—any time.

Self-cleaning feature is particularly important on crude oil tank lines.

GROVE SEAL-"O"-RING Gate Valves

SUBSIDIARY OF WALWORTH

GROVE VALVE and REGULATOR COMPANY • 6529 Hollis St., Oakland 8, Calif.
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GROVE SEAL O RING ® GROVE SIMPLICITY ACCURACY SAFETY

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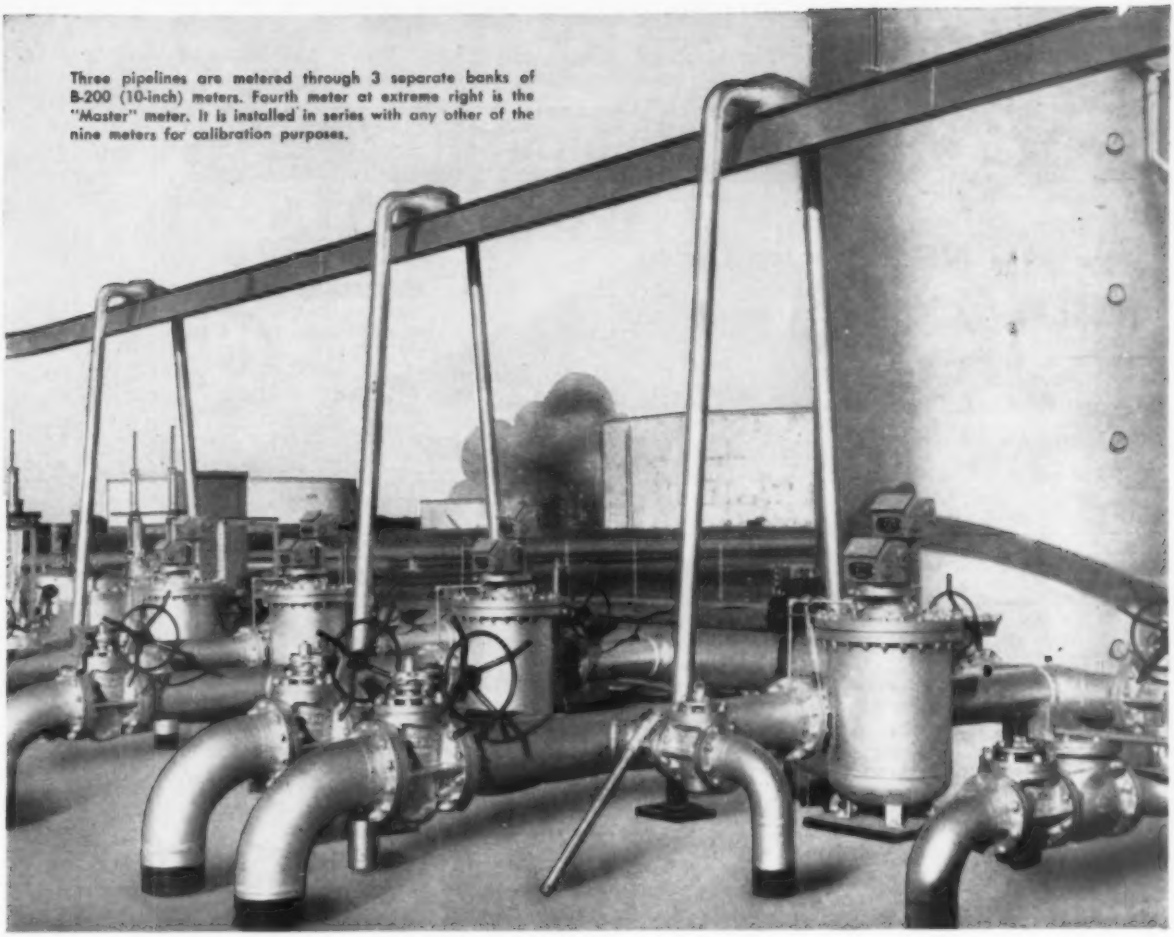

Three pipelines are metered through 3 separate banks of B-200 (10-inch) meters. Fourth meter at extreme right is the "Master" meter. It is installed in series with any other of the nine meters for calibration purposes.

three A. O. Smith meter banks effect savings by

Cutting Breathing Loss!

for major crude pipeline located in the Gulf South

This installation of A. O. Smith pipeline meters reduces breathing losses by eliminating tankage used for measurement purposes. Crude runs are dispatched directly to the refinery.

Daily throughput of all ten meters totals approximately 275,000 barrels.

For complete details on how you can get similar savings, cut equipment dollars and space needs, contact your representative or write direct.

Through research ... *a better way*

A.O.Smith

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METER, SERVICE STATION PUMP, DIVISIONS

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TAKE A CLOSE LOOK . . .

. . . AT A REAL CASING SEAL

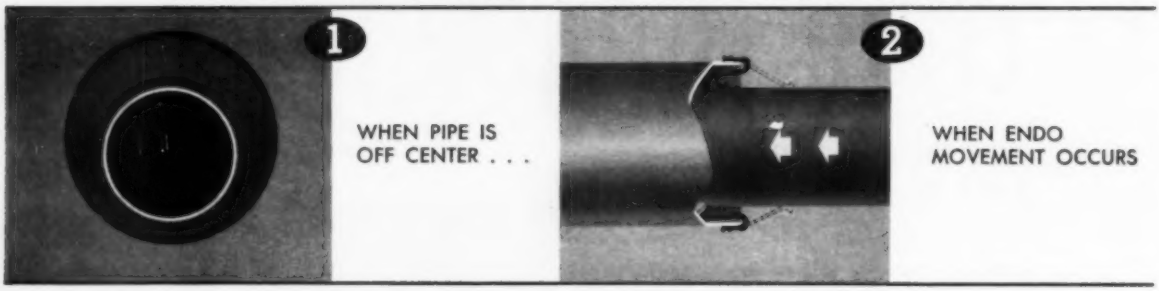
The ***NEW***

WmSEAL "Z" BUSHING

FOR BIG-INCH PIPELINES IN STANDARD OR OVERSIZE CASINGS

NEW ELONGATED LIP
TWICE AS LONG . . . TWICE AS FLEXIBLE (See fig. 1 & 2)
CUTAWAY VIEW
STAINLESS STEEL BAND, ANCHORED SECURELY BY S. S. CLAMPS
STAYS PUT ON CASING
NON-SKID TEETH AND EXTRA LONG GRIPPING AREA ANCHORS BUSHING SECURELY
PUNCTURE PROOF
EXTRA THICK SHOULDER (BUNA-S SYNTHETIC RUBBER) PREVENTS CASING EDGE FROM CUTTING THROUGH BUSHING
NO SHIELD REQUIRED
THICKER FLEXIBLE "LIP" ELIMINATES NEED FOR SHIELD. WITHSTANDS WEIGHT OF BACK-FILL EARTH

A TIGHT SEAL UNDER ADVERSE CONDITIONS



FOR PIPELINES IN SERVICE

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(Write for Literature)

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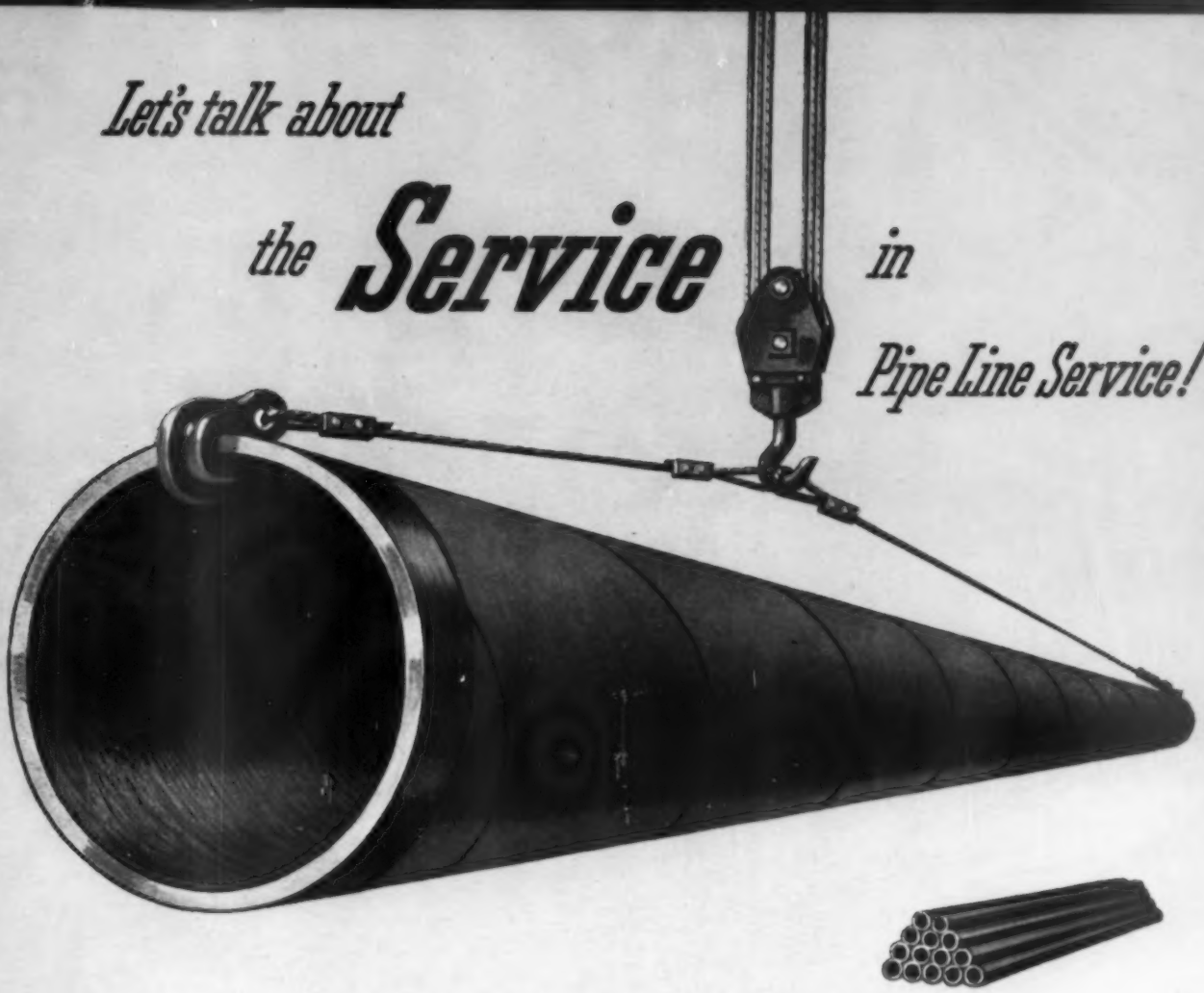
Let's talk about the **Service** *in Pipe Line Service!*



A company doesn't become a leader through quality of product alone. Although Pipe Line Service through the years has proved consistently that quality depends on coating and wrapping under controlled plant conditions, *service* is half the battle.

By service, we mean storing your pipe *at no cost to you* . . . plants strategically located near your sources of supply . . . and large storage facilities to allow you to purchase pipe when delivery is most favorable. Your pipe will be held in storage until needed—and then coated under the PLS high standards of uniformity.

You *always* get a freshly applied coating job at the time pipe is ready to be laid. And PLS will ship your protected pipe *where* you want it . . . *when* you want it!

All this, *plus* the service of a PLS representative when needed. It's his job to help you in the proper handling, storage and laying of PLS protected pipe, to give you the maximum return on your investment.

This combination of quality *and* service assures you of the finest in pipe protection. On your next coating job call in your nearest PLS representative—you'll find that he can save you time, trouble and money.

There's a PLS plant strategically located to serve YOU!

Also sales offices at

Atlanta, Georgia
Tulsa, Oklahoma
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PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK - ILL.

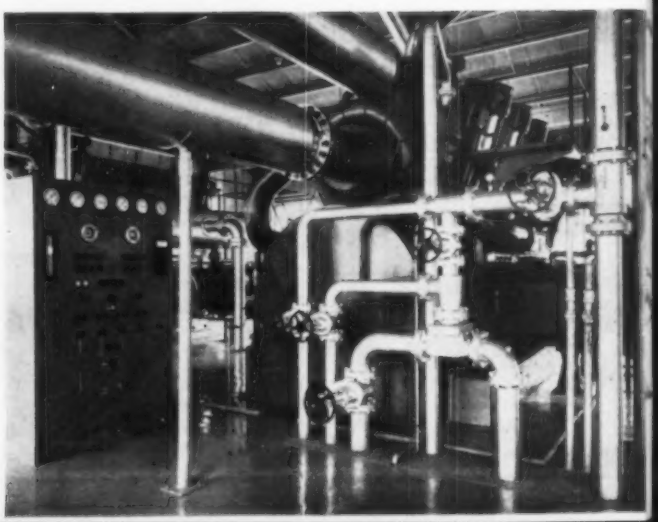
Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

Sequence controlled Cooper-Bessemer GMWA compressors in the Sublette, Kansas Station of Northern Natural Gas Co.



In the Sunray, Texas Station . . . control panel for automatic single-switch operation of powerful Cooper-Bessemer compressors.

Cooper-Bessemer 2000 hp compressor in the mainline Mullinville, Kansas station of Northern Natural Gas Company.

Northern Natural does it

Automatically

At the Mullinville, Sublette and Sunray stations of Northern Natural Gas Company . . . *Cooper-Bessemer GMWA compressors are started and put on line by energizing a single switch.*

This method of automatic sequenced control not only greatly simplifies compressor operation, but results in unmatched over-all station economy.

This example of gas pipeline pioneering is typical of the continuous development work underway at Cooper-Bessemer. It's typical also of the new advantages gained by our close cooperation with pipeline engineers and the interchange of new ideas!

For the very latest in design and engineering development . . . economy, too . . . check with the office nearest you. Cooper-Bessemer engines and compressors are available from 200 to 10,000 hp.

BRANCH OFFICES: Grove City • New York • Chicago • Washington • San Francisco • Los Angeles • Houston • Dallas • Odessa • Pampa • Greggton • Seattle • Tulsa • St. Louis • Kansas City • Minneapolis • New Orleans • Shreveport

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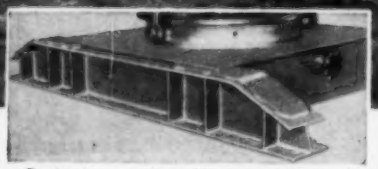
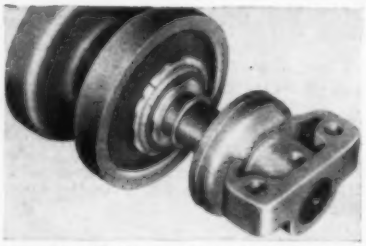
built for pipeline work



Carbody . . . wide and heavy to withstand stress. Three-piece removable bottom cover plate. Hinged center panel.

Crawler End Tumblers equipped with bronze seal rings.

Swing and Travel Shafts . . . large diameter with involute splining for greater reserve strength.



Crawler Rollers protected by bronze seal rings and by neoprene rubber O-rings.

The challenge of pipeline work has been a good test for the ruggedness and dependability of Insley excavators and cranes. Insley's wide-spread popularity and leadership in the pipeline construction field prove Insley's capability in meeting this challenge.

The Insley Pipeliner is *built* for pipeline work. It is a high performance machine with the durability that the tough jobs demand.

Heavy Duty Hoe Attachment • Box-Type Jackframe • Optional: Two-Speed Travel • Tractor Type Crawlers • Brake Type Cab Lock • Independent Boom Hoist • Independent Travel

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Equipment and Methods —A Working Team

Sometimes the equipment comes first, pointing the way to a better technique. Sometimes the idea leads, with equipment manufacturers meeting the challenge

Frank H. Love, *Editor*

Progress of methods and equipment in the pipeline industry is an evolutionary, or gradual, process, never one of magical suddenness. Components are many individual developments, all trending in a definite direction. In the field of operations it is, at the moment, an increasing use of instruments. In the category of construction it is numerous things — use of high tensile strength thin-wall pipe, heavier equipment to get the job done in minimum time, better welding methods, etc.

Offshore laying of pipe, a specialized phase of construction, has witnessed some developments that are rather on the spectacular side. This is natural because of its relative newness in comparison with land-line construction, which consequently makes it more subject to experimentation and change.

A concrete example is an underwater job in California, which, during the past year, has developed a host of new ideas. Necessity was really the mother of invention in this case. Specifications called for the 22-in. pipe to have a ½-in. cement mortar coating internally and 1⅛-in. concrete coating externally. Laying the line without cracking the coating was the contractors big problem. The plan followed was to pull the pipe along the bottom of the Pacific Ocean, but this could only be accomplished by devising special equipment.

As damage to the coating was the principal inspection factor, two innovations were introduced. A cathodic protection cable was attached to the pipe, which was kept under constant cathodic protection. Any break in the coating would show immediately on the instruments monitoring current demands. As a further inspection method, divers were sent underwater from time to time with TV cameras that permitted men on the laying barge to view the line.

Laying barges for underwater work have undergone continuous development since they became an important part of pipelining a few years back. What is among the largest pipe-laying barges ever built was launched the early part of this year. Owned by Brown and Root, it weighed anchor for Venezuela in March to undertake an outstanding project for Creole Petroleum Corporation. To extend Creole's existing gas-gathering system in Lake Maracaibo, approximately 14 miles of 40-in. pipe is being laid, more than eight miles of 30-in., and close to two miles of 16-in. The enormity of this undertaking is indicated by the fact that the 40-in. pipe, when reinforced and coated with concrete has an overall dimension of 52 in. and each 40-ft joint weighs approximately 20 tons. It takes well designed and constructed equipment to handle pipe of this size and weight.

Gas Turbines for Pumping Oil

Trans-Arabian Pipe Line Company has made some interesting innovations in pumping to increase the capacity of its system. The units are special pumps driven by 5000-hp combustion gas turbines. Two types of units were installed: (1) Portable prefabricated units for unattended operation at intermediate stations, and (2) permanent units at existing stations.

The portable units were designed especially for this project and are most unusual. Each consists of four vans: (1) A gas turbine-pump van, (2) a control and filter van, (3) a radio van, and (4) a portable shop van.

The turbine-pump van is divided into two rooms. One contains the gas turbine, the other the pump. The rooms are separated by a firewall, with the turbine side pressurized. Fuel for the gas turbine is crude oil taken from the pipeline with an additive of hydrous magnesium sulfate to minimize corrosion of the turbine blades. The main pump is driven directly at gas turbine speed of 5000-6000 rpm. The pump also was specially manufactured and has the unique features of weighing less than 0.8 lb per brake hp and delivering in excess of 600 psi differential with a single-stage impeller.

Trans-Arabian officials feel that the feasibility of unattended gas turbine pumping units changes the economics of station spacing for large diameter pipelines in the Middle East.

Another experiment in pumping that proved successful was Texas Eastern's installation of three single unit gas compressor stations each having a specially built 15,000-hp motor, largest in use in gas transmission service, driving a single-stage centrifugal compressor. This is an entirely new kind of gas pumping station and has these additional features: (1) Across the line starting, (2) the single-stage compressor develops a compression ratio of 1.5:1, highest to be achieved, (3) electronic surge control, (4) low investment cost, and (5) low operating cost.

Low investment cost has become a salient factor in pipeline construction. Special emphasis was placed on this point both by Texas Eastern ($114.04 per installed hp) and Trans-Arabian ($250 per hp).

Automatic Custody Transfer

After a slow beginning, a period during which the pros and cons were hotly debated, lease automatic custody transfer has arrived and is growing rapidly. Distrust of the accuracy of measurement was an early deterrent to widespread acceptance of ACT. When improved equipment demonstrated that unattended custody transfer measurement could be as accurate as when a gager did the job, and, further, that it offered an economic advantage, attitudes began to change. It was not an overnight change, however, and the credit goes largely to the American Petroleum Institute for its coordination of activities on the subject.

The extent of ACT acceptance is demonstrated by the fact that 99 installations are now in operation, handling about 170,000 bbl of oil a day. The total number of installations has

almost tripled each year since 1954, and should this rate of growth continue, as it is expected, it will be only a few years before a most significant share of total production in the United States and Canada will be handled in unattended ACT operation.

Automation

Automatic custody transfer is a part of automation, of course, but it is only one example of how rapidly and how diversified instrumentation is becoming. Another outstanding example is the increasing popularity of so-called "satellite" stations. These, of course, are the stations that are unattended and fully operated from a remote point. Such stations at present are found on all types of pipeline systems — gas, crude, and products.

Although automatic controls have gone far in effecting operating economies, it is realized that much more can be done, with the ultimate goal greater margins of profit. As gas transmission and gathering systems become larger and more complex, operators are realizing a need for greater automatic control.

Stanford Research Institute has made a study and advises what additional automation is needed for integrated control of transmission and gathering systems:[1]

1. Direct central control and operation of all compressor stations.

2. Automatic calculation of flow conditions upon which control decisions and orders are based.

3. Integrated data communications system to link all automatic functions.

Stanford's engineers believe it is possible to develop methods and equipment to combine these elements. Says SRI: "Such an integrated control system could be constructed so that output demands and line status records would be fed into a central control device to operate all compressor stations at optimum efficiency. The control device would consist of a computer capable of receiving and evaluating all input data to decide what action to take. The machine also could calculate the new conditions necessary for changes, and send control signals to the appropriate stations. By feedback of normal line status records, the machine would ascertain that its orders were carried out and would monitor for troubles."

RCA has in an advanced stage of development a master control system for gas gathering and oil pipelines. It is the result of a study that revealed the need for a system to provide centralized control of many points on a party line basis. It will integrate supervisory control, data logging, alarm reporting, and computer programming.

Pipe Protection

With cost of steel, labor, and construction at a high level, it is imperative that line pipe be protected adequately. Proper coating well applied, and supplemented by cathodic protection, is the generally accepted solution. Because of these protective materials and methods it is necessary to use steel only of a thickness required by the designed working pressure plus a factor of safety. Adding to the thickness of the pipe wall to provide for anticipated corrosion is no longer essential and is poor practice.

There are many kinds of good coatings already in use, but this does not prevent research and experimentation to produce a product that someone thinks is better, has certain advantages, or is designed to serve a special function.

Continuing tests are being made with a thin paint-like coating made of epoxy resin, coal tar, and a catalyst. The coating is sprayed on the pipe to a thickness of approximately 11 mils. Dielectric strength is about 700 v per mil of thickness. Transcontinental Gas Pipe Line engineers have been experimenting with the coating for several years and the latest test is being made in McMullen County, Texas.

Communications

Refinements continue to be made in microwave equipment to the end that more functions are constantly being performed by this medium. Improved equipment is individually described in this issue. Stanford Research Institute has done significant work in this area also, of great interest because it could have a considerable influence on microwave system design and equipment of the future.

SRI scientists have developed a means of reflecting VHF signals off meteor trails as far as 80 miles above the earth and thereby obtain a hop on the order of 800 miles. As the signal is intermittent, lasting only a few seconds, the messages are recorded on tape and broadcast at very high speed during the few seconds of broadcasting time.

On the following pages will be found descriptions and engineering data on the most important equipment devised or developed during the last year. These are the tools that are helping to build pipelines faster and more economically, and operate them more efficiently. ★

[1] "Automatic Control Systems for Gas Transmission Pipelines," G. A. Barnard III, *The Pipeline Engineer*, May 1958, p. D-47.

What's new in . . .

Pipeline Equipment

Leading manufacturers and pipeline suppliers report their latest developments

Construction

Sideboom and Blade Backfiller

150 The International Harvester TD-9 diesel crawler tractor and the SBI-91 sideboom provide a unit ideal for both maintenance work and pipe laying. This lightweight unit lifts pipe loads up to 17,000 lb at 4-ft overhang. Addition of the 91 AF blade backfiller eliminates the need for 2 crawlers to handle pipe laying and backfilling.

Controls for tractor and sideboom are located in a group to the front and right of the operator. Another safety feature is the automatic boom power throw-out which prevents injury to the operator and damage to the boom by preventing the boom from being winched beyond a vertical position. Rear power take-off clutch permits

raising or lowering the boom, or load, at any time, when the tractor is in motion or stopped. *International Harvester Company.*

Hydraulic Internal Line-up Clamp

151 A hydraulic internal line-up clamp has been introduced by M. J. Crose Manufacturing Company. This new product provides extra power for pipe line-ups with the simplicity of a manual operation and with pipe pounding eliminated. Hydraulic power requires no motors, no air lines.

The clamp is available in models to handle pipe 22 to 36-in. in diameter. Larger models are built by special order. *M. J. Crose Manufacturing Company, Inc.*

Versatile Shovel-Crane

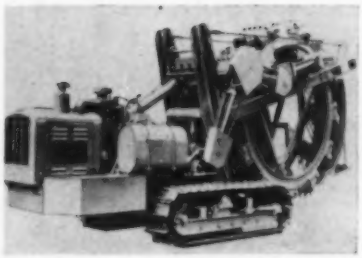
152 A new type of construction tool, fully convertible to shovel, crane, clamshell, drag and hoe, has been introduced by The Thew Shovel Company. It is Model SP-107, a self-propelled machine mounted on a short-coupled, rubber-tire carrier with 4-wheel drive. Optional equipment provides for hydraulic power steering of

all 4 wheels, in which case wheels on either axle may be steered independently of those on the other axle.

The power-take-off on the turntable is through an automatic transmission and torque converter. This coupled with the single speed transfer case on the carrier provides 3 travel speeds in both directions up to 15 mph. Independent travel provides for traveling, hoisting, swinging, and boom derricking simultaneously with each under separate clutch control. *The Thew Shovel Company.*

Wheel-Type Trenchliner

153 A big capacity trenchliner, the Parsons 170, has been added to its line of wheel-type trenching machines by The Parsons Company. A new feature of the 170 is a hydraulically driven conveyor that provides belt speeds up to 600 ft per min, yet works independent of the wheel speeds. It is possible to place spoil at a convenient distance from the trench wall when



wheel speeds are slowed due to tough digging conditions.

The machine will produce from 12 in. to 25 ft of trench per minute in a range of 30 digging speeds. Maximum digging depth is 5 ft 9 in. A selection of 7 cutting widths are available, extending from 20 to 32 in., in 2-in. increments. Power is furnished either by a standard 60-hp gasoline or 54-hp diesel engine. Tractor type crawlers with replaceable links, pins and bushings can be either standard 16-in. grouser type or 12-in. flat shoe type. *The Parsons Company, division of Koehring Company.*

Rubber-Tired Front End Loader

154 The Thew Shovel Company has announced production of the first model of their new line of rubber-tired front end loaders. The line has been named Moto-Loader and the first model announced is a 4-wheel drive, 1¾-yd capacity unit, designated Model ML-153.

The loader, available with either gasoline or diesel power, utilizes a 3-speed, power-shifted, full reversing transmission and integral torque converter with a 2.5 to 1 ratio. Top speed is 21.4 mph. Use of the integral torque converter provides an infinite number of "gear" ratios in each speed range. Shifts can be made into any of the 3 operating ranges under full power. Planetary axles are used both front and rear. Bucket roll-back at carry position is 40 deg. Forward reach at 7 ft dumping height is 40 in. Peak lift capacity is 11,000 lb at 0 mph with a carrying capacity of 6000 lb at 4 mph. *The Thew Shovel Company.*

Hydraulic Tilt-Dozers

155 A tilt-crown bulldozer blade for land clearing, breaking out hard ground, cutting ditches, etc., has been developed especially for the higher speed 80 and 100 hp Case TerraTrac crawlers. The blade is controlled by hydraulic valve levers located on dashboard near operator's right hand. With one hand, operator can move one lever forward and the other backward to drop either corner of the blade as much as 14 in. below horizontal. Moving same 2 levers together causes blade to tip as much as 10 deg fore or aft for maximum rolling and scouring action from involute curve moldboard.

The Model 800 (up to 20,000 lb push or pull) and Model 1000 (up to 24,000 lb push or pull) both feature Terramatic power-shift transmission, giving operator independent control of each track. Torque converter automatically balances speed to load. Both models also feature torsion-bar track suspension, which allows tracks to oscillate over rough terrain as much as 10 in. while maintaining uniform cut, with full power and traction on both tracks. *J. I. Case Company.*

Hydraulically Operated Sideboom

156 Midwestern Manufacturing Company has announced a new design for their hydraulically operated "Little Boomer" sideboom, which is attached to the new John Deere 440-IC crawler tractor. The design employs one double-drum winch in place of the 2 separate winch drums which were formerly used. This design change puts the winch drum in a position where the operator can easily check the condition of the cables at all times.

The company increased the strength of the sideboom frame and boom in the new design to compensate for the increased lifting capacity provided by the heavier tractor. Units of this size are capable of handling 2-in. to 10-in. pipe. *Midwestern Manufacturing Company.*

Ditch Padding Machine

157 The CRC ditch padding machine, adaptable to any standard ¾ cu yd dragline, has been introduced. The machine consists of an endless steel wire grid, 5 ft wide, rotating on a shaker track system which loosens dirt from rocks in the spoil. A backfill bucket drags the spoil onto the grid which is suspended across the ditch by the dragline boom. Fine dirt is shaken through the grid and onto the pipe, with all rocks larger than the grid openings conveyed across to the working side of the ditch. *Crutcher-Rolfs-Cummings, Inc.*

Versatile Crane-Excavator

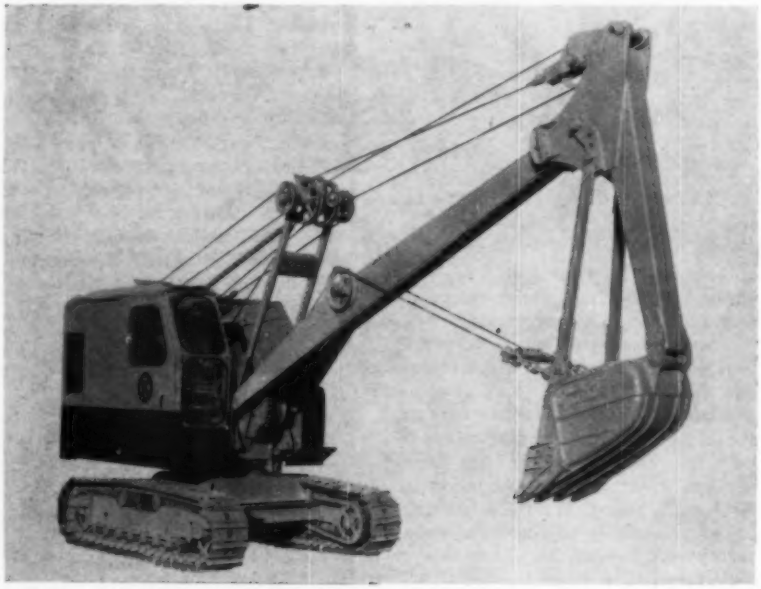
158 Schield Bantam Company's 7-ton CR-35 crane-excavator unit features one-man, one-engine operation, and works with any of 10 different front-end attachments. The model has a 19½-ft outside turning radius and, with special goose-neck crane boom, will handle 2½-ton loads working under a 10 ft 5 in. clearance. With backhoe attachment, the unit will average 100 ft of 5-ft trench per hr. With clamshell, the Bantam will average 80 cu yd per hr. *Schield Bantam Company.*

Full Encirclement Pipeline Cradle

159 The Maloney Model 58 cradle is of full encirclement design and supports the carrier end, within the casing, all the way around the diameter. The body of the cradle is 2 bands of steel, 2 in. wide, with an overall width of 7 in. Runners are steel and Neoprene. Ribbed rubber lining on the bands provide double insulation and protection to the pipe coating. Built-in tension in the cradle allows installation without bolting. Backfill cannot displace the carrier against the casing in any direction. Cradle is available in any combination of carrier-casing pipe sizes. *F. H. Maloney Company.*

"Funnel" Aids in Pipeline Construction

160 The Maloney "Texas Steer" simplifies pushing the drag section through the casing on highway crossings and eliminates hanging up insulators or breaking insulators during the drag. Basically a funnel, hinged along the back, the unit is lowered into place on the casing end with a side boom. Break-over bolts allow it to be clamped tightly in place with a collar portion sized to fit around the casing. The small end of the funnel is designed to provide a flush, butt-joint with the casing end. With the unit in place, the drag section is easily run in without delays, in perfect alignment. *F. H. Maloney Company.*



Hoe with Tractor-Type Crawlers

161 Tractor-type crawlers, introduced on the Koehring 305 hoe, offer the pipeliner and other hoe users a track that gives long service with reduced maintenance. Overall width of the crawlers with 20-in. wide shoes is 9 ft 5½ in. Overall length of the standard size crawler is 12 ft.

The hoe has a maximum digging reach of 31 ft and can go down to a depth of 19 ft 9½ in. Clearance height at maximum dumping height of the ¾ yd dipper is 25 ft 2½ in. Clearance height at the beginning of the dump is 12 ft 10 in., increased to 18 ft 7 in. at the end of the dump. Two-speed independent traction is optional on the 305. *Koehring Company.*

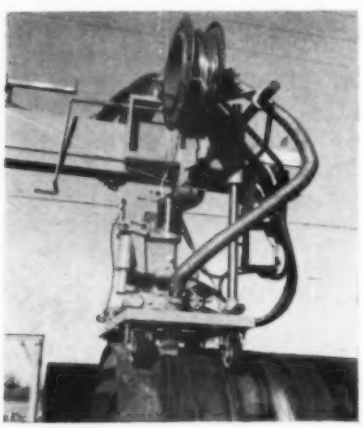
Unit Surveys Underwater Crossings

162 A new Sperry-Sun "Mole" is available for determining plan and profile projections of underwater pipeline crossings. The major items of the unit's measuring equipment are a gyroscope for horizontal angles, an inclinometer for vertical angles, a clock for establishing time, and a camera and associated equipment so arranged that photographs of the angle units and the clock are taken at 15-second intervals.

By knowing time and footage in the pipe as developed by the above-ground equipment, and having a knowledge of horizontal angles, vertical angles, and time as developed by the mole, a complete set of data representing a rod-and-transit survey made inside the pipeline can be assembled. The unit is small enough to traverse a flat 10 in. through most 12 in. pipe, and through any line 14 in. and larger which has only cold field bends in it. *Technical Consultants.*

Self-Compensating Welding Head

163 A self-compensating welding head was introduced this year on the first production model of the Crose-Price-O-Matic automatic pipe double jointer. The welding head, designed and built by M. J. Crose Manufacturing Company, is mounted on a carriage with wheels that ride the pipe, thus automatically tracking pipe travel.



The design of this floating head permits compensation for any "dog leg" or out-of-round pipe, thereby allowing automatic external welding to proceed without any reduction in welding speed. Welding speeds up to 100 in. per min are obtainable. This feature of the double jointer, together with facilities for internal welding and automation of pipe handling equipment, reduces by one-half the number of manual welds out on the line. *M. J. Crose Manufacturing Company, Inc.*

Centerlined Flanges Speed Construction

164 Centerlining of flanges, a recently added feature in flange manufacturing, assures correct angle for valves in line. Centerline is placed on the welding neck and on the OD of the flange, centered between the bolt

holes. A centerline on a flange assures that it is welded on a pipeline with the bolt holes in the correct position. The centerlining of flanges by hand takes a man from 15 to 20 min, and can be a costly operation when thousands of flanges are used. *OTM Corporation.*

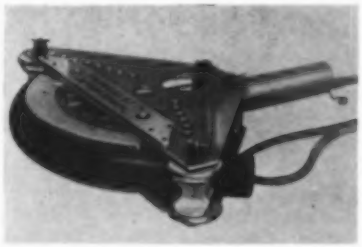
Side Boom on Rubber Tires

165 The Sooner Boomer, mounted on industrial type wheeled tractor, is an all-hydraulic conventional combination side boom, incorporating an angle dozer and a rear winch. Hydraulic counterweights are provided as a stabilizer and the machine is rigged to bend pipe through 8-in. in diameter. The unit can travel at speeds up to 27 mph.

The angle dozer attachment is effective in dressing down, backfill, or spoil bank work, since the weight of the machine is distributed to give the maximum amount of traction. The dozer attachment may also be used to stabilize the machine when an extra heavy lift is required or when working the load at a wide radius from the tractor. The rear winch has a 6000-lb line pull and a 100-ft capacity drum. *Sooner Boomer Manufacturing Division.*

Portable Hydraulic Pipe Bender

166 With one smooth ram stroke, the new lightweight Greenlee hydraulic power bender makes up to 90-deg bends in pipe ranging to 4-in. diameter. The bender features universal pipe supports accommodating 10 sizes of pipe or rigid conduit from ½-in. diameter. Operation with either of 2 types of power pumps has the feature



of fast, low-pressure ram approach with automatic changeover to high-speed drive when the work is contacted.

Front loading and other special features make one-man setup and operation easy. A scale enables operator to reproduce any bend or make bends to specification. Light but strong aluminum alloy has been used wherever feasible to produce important weight savings with no sacrifice of strength. *Greenlee Tool Company.*

Three-Yard Hoe Attachment

167 Link-Belt Speeder has announced what it describes as the only production model 3-yard hoe attachment available in the shovel-crane industry. The new attachment is designed for use with the Link-Belt 3-yard model K-608 which, with the attachment, can be used as hoe, shovel, crane, clamshell, or dragline. Its 30-ft boom, plus arm and bucket, provide a maximum reach of 51 ft 6 in. and digging depth of 31 ft 10 in. Cutting width with side cutters is 5 ft. *Link-Belt Speeder Corporation.*

Automating the Gas Transmission System

Many large companies are planning and installing today for the inevitable expansion they see coming in semi-automatic and complete automatic control

Newton E. Armstrong
Southwestern Industrial Electronics Company

MANY of the larger gas transmission firms are currently planning and installing today for the inevitable expansion in semi-automatic and completely automatic control of gas pipeline systems.

The benefits of a fully automatic pipeline, where all functions and controls are performed by mechanical operation, are becoming more apparent as new pieces of automation equipment are installed. These benefits include increased efficiency and higher output flow under variable weather and mechanical conditions. Better utilization of personnel for greater efficiency, safety, monitoring, and improved management are direct advantages gained through automatic operation of a gas pipeline.

Design Considerations

Design and construction of new equipment to replace that in existence should follow careful analysis of the complete system and future requirements to avoid unnecessary equipment programs and engineering. Each manually operated unit purchased today should be capable of adaptation to at least semi-automatic control. Companies engaged in increasing the extent of their automation should prepare and study their final plans before selection or installation of equipment.

In the ultimate fully automatic pipeline, compressor reliability is of prime importance since control elements are usually applied satisfactorily. Valves should be of durable design, operate at the proper speed, and maintain adjustment. The greatest cost in automatic control involves measurement equipment, communications units, computers, data processors, and actuators for valves and compressors. Proper use and selection of these units provides an efficient system design. Here the system costs should be considered rather than individual unit costs. Duplication of equipment must be avoided, standard apparatus should be installed, and it is economical in the long run to have qualified engineers in communications, computers, and control systems as consultants when deciding on a purchase.

The design of automatic pipeline control systems depends on economic factors, computer and control limitations, available power, communications, and gas transmission problems including those relative to geographical location. Several basic concepts must be considered when viewing the complete system plan. Measurements should be made only when necessary and then only to the accuracy required. Information should be transmitted only to those points where needed. Highly reliable equipment should be utilized where custody transfer or safety are directly involved. Computers should make all possible decisions to avoid human error and should be located in close proximity to the devices to be controlled.

(Continued on Page D-35)

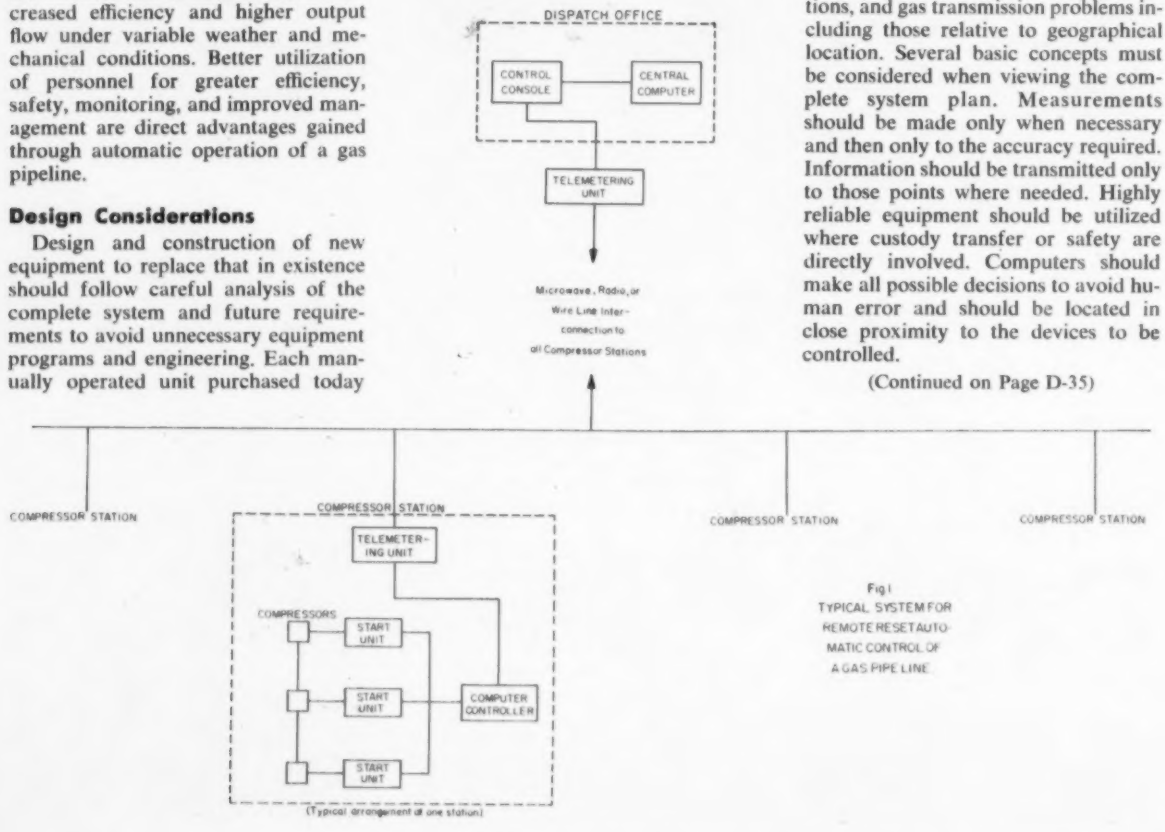


Fig. 1
TYPICAL SYSTEM FOR REMOTE RESET AUTOMATIC CONTROL OF A GAS PIPE LINE

You're Money Ahead to
MEASURE PIPE PROTECTION WITH A CALENDAR

How should pipe protection be measured? By first cost? By ease of application? By appearance?

With all the claims made for protective tapes, too often the most important consideration is overlooked—the simple point of how long and how well it will protect the pipe.

Since 1941, when TAPECOAT originated coal tar coating in tape form, this protection has proved to be the best that money can buy for combatting corrosion underground or under water. Lines in service, TAPECOATED as far back as 17 years ago, show no signs of deterioration—a record of uninterrupted performance *no other type of tape can match*. Think what this means in terms of preventive maintenance and elimination of replacement costs!

After all, hot-applied coal tar has proven over the years to be the most dependable and enduring protection. And because TAPECOAT is a hot-applied coal tar coating in tape form, it offers the same lasting protection.

A TAPECOAT sales and service engineer is available at all times to assist you on any corrosion problem and on the various applications of TAPECOAT.

Write for complete details today.

PROVED IN SERVICE

...Underground or Under Water on

Pipe	**Tanks**
Pipe Joints	**Tie Rods**
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TAPECOAT comes in rolls of 2", 3", 4", 6", 18" and 24" widths—sized to the job. Available also in asphalt. Where primer is desired, specify TC Primecoat, the compatible coal tar primer.

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A PROTECTIVE COATING

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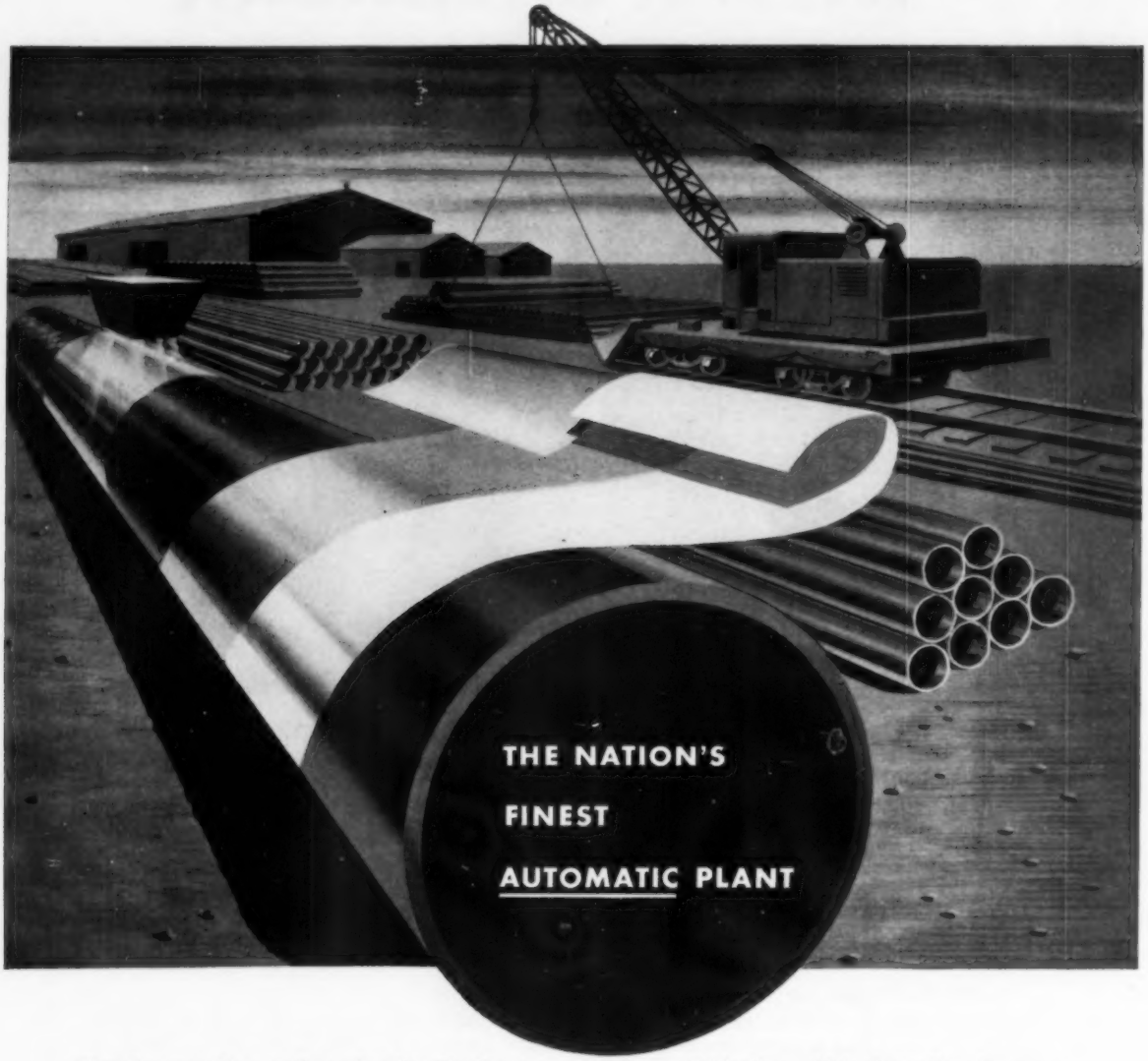
Call Southern ... for the fastest service on the finest quality coated and wrapped pipe



Now in operation—and serving the Southeast—our new Southern Pipe Coating Company plant, offering the nation's finest *automatic* pipe coating and wrapping. Better service, exceptionally qualified personnel, strategic location (with in-transit privileges), new modern 17-acre facility—all make the Southern story so welcome to gas and gasoline transmission and distribution companies. A special emphasis is made on cleaning all pipe by modern grit blasting, which cleans the pipe more quickly and evenly, permitting a smooth, even coating of primer, enamel and wrapping. We can also store your bare pipe in our yard, if you require, and our truck fleet can deliver anywhere in the South. We will give immediate shipment to the job site—on time—with the exact pipe you need, coated and wrapped to your specifications. Try Southern—for quality, dependability, service.

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OVER A MILLION CHANNEL MILES OF RCA MICROWAVE NOW IN SERVICE... RCA

Here's Your "Economy-Model" Microwave

New RCA MM-9E Equipment Specially Designed for Short-Haul Unattended Operation

If you do not require an elaborate microwave system, the MM-9E will provide you with quality equipment at a low price . . . ideal for short-haul systems utilizing up to 24 channels. Simplified circuits and low power drain make it highly adaptable to battery operation; or for portable use where temporary application is indicated. Conservative design and direct crystal control of transmitter and frequencies contribute to its suitability for unattended operation.

- **Can be pole mounted, for economy**
- **890-960 MC frequency band for optimum microwave propagation**
- **Modulation band width 140 KC. 24 channels FCC type accepted**
- **Low equipment voltage required— Maximum 130-150 volts**
- **Utilizes new pencil triodes for dependability**
- **No blowers**
- **Standby equipment available**

DESCRIPTION OF EQUIPMENT

High quality receiver, a single superheterodyne type using direct crystal-controlled local oscillator, is mounted on a single panel. Transmitter, a single-chassis unit, makes use of phase modulation, direct transmitter control of transmission frequency and simple cavity construction designed for reliable operation and ease of maintenance. Equipment can be provided either as a simple terminal or back-to-back repeater with or without standby.

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RCA Type MM-9E assemblies are furnished in a number of arrangements. The services of RCA Communications specialists are available to assist in determining specific requirements. For further information, use coupon.

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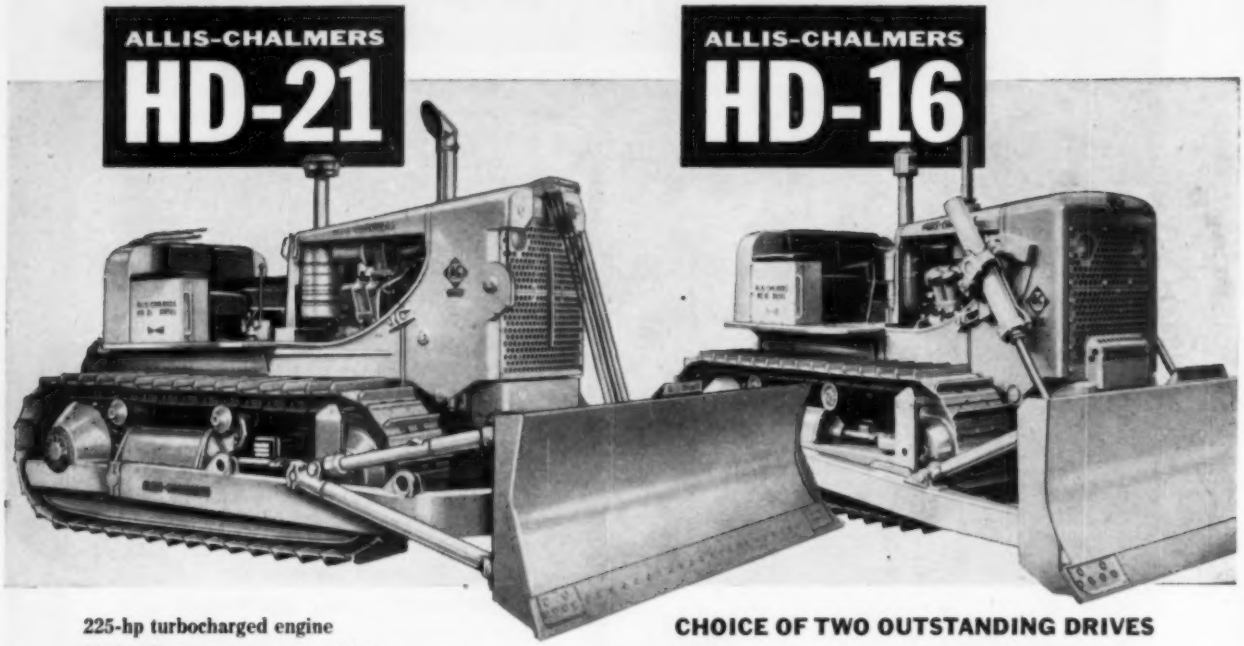
first choice on more and



225-hp turbocharged engine
Hydraulic torque converter drive
56,260 lb (approx. as shown)

The new HD-21 brings you live power for today's big-tractor jobs—and torque converter drive puts it to work automatically. The HD-21 offers more work capacity—dollar for dollar—than any other big crawler tractor you can buy.
HD-21A illustrated—Two other models available

CHOICE OF TWO OUTSTANDING DRIVES

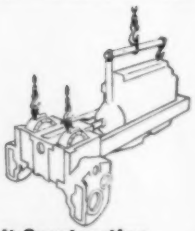
Hydraulic torque converter	All-gear drive
150 net engine hp	141 belt hp
39,090 lb (approx. as shown)	125 drawbar hp

Get up on the HD-16 yourself—and see how it handles jobs ordinarily assigned only to bigger, more expensive crawler tractors. You'll sell yourself—just as more keen-eyed construction men do every day.
HD-16DC illustrated—Five other models available

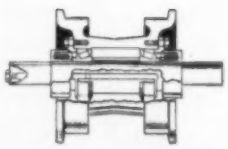
THE ONLY COMPLETE LINE OF CRAWLER TRACTORS

Pioneered and proved by Allis-Chalmers Engineering in Action

Torque Converter Drive gets more work done—automatically provides the right pull or push for every load, at maximum speed for existing conditions. *(Available in HD-21 and HD-16 only.)*



Unit Construction saves valuable time . . . lets you remove any major assembly without disturbing adjacent assemblies.



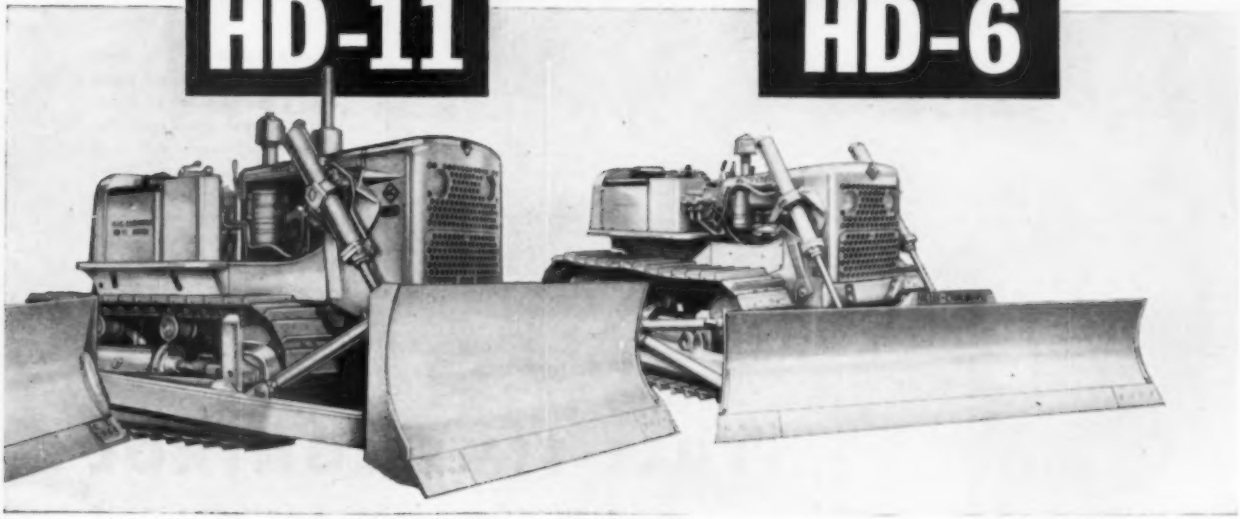
1,000-Hour Lubrication intervals for truck wheels, idlers, support rollers . . . changes daily greasing time into production time.

Look ahead...*move ahead*...and stay ahead

more tough jobs

ALLIS-CHALMERS HD-11

ALLIS-CHALMERS HD-6



94 belt hp

25,960 lb (approx. as shown)

The HD-11 is setting new standards in its size range . . . offers you dozens of work-boosting advantages, including the industry's easiest shift pattern. A single shift takes it from any forward speed to any reverse—gets short-cycle jobs done faster, easier.

HD-11B illustrated—Two other models available

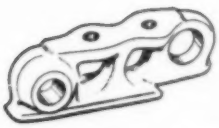
63 belt hp

16,470 lb (approx. as shown)

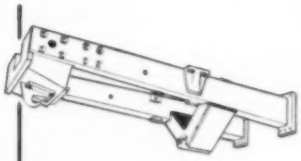
Here's up to 15,500 lb drawbar pull. The HD-6 is the only tractor near its size with big-tractor design advantages—for example, All-Steel Box-A main frame and engine-mounted dozer with direct-lift cylinders for improved weight distribution, accurate dozing and long life.

HD-6E illustrated—Three other models available

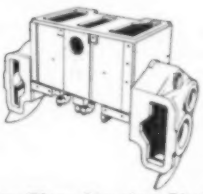
THAT GIVES YOU ALL THESE ADVANTAGES IN EVERY SIZE



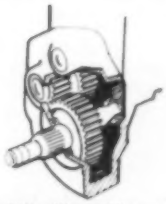
True-Dimension Track heat-treated and machined in the industry's most modern facilities, is setting new track-life records on every type of work.



All-Steel Box-A Main Frame soaks up shock and strain . . . provides improved weight distribution and equipment mounting.



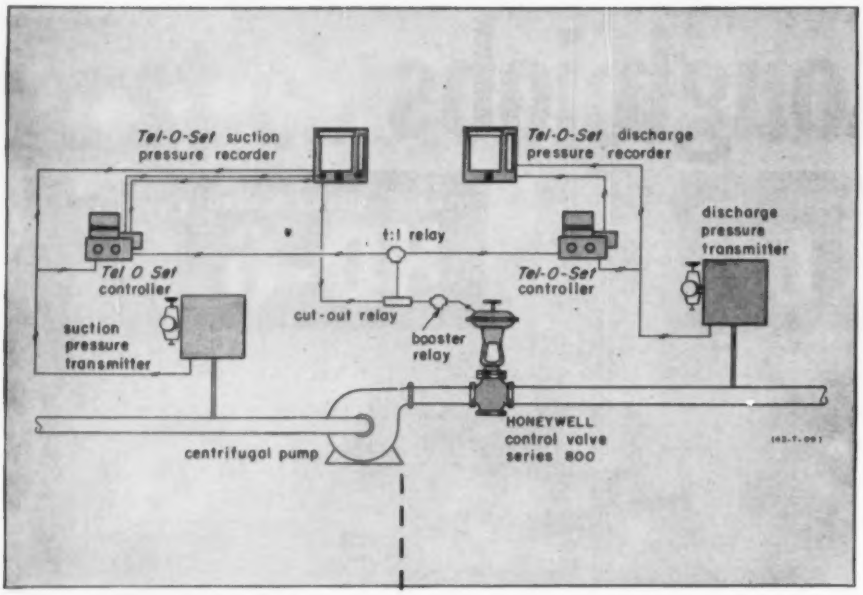
One-Piece Steering Clutch and Final Drive Housing with extreme rigidity and strength . . . line-bored to provide precise alignment of gears and shafts.



Straddle Mounting of All Final Drive Gears with tapered roller bearings on both sides of short, large-diameter shafts . . . provides extra gear life.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

with ALLIS-CHALMERS



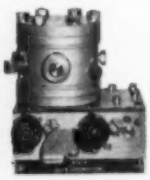
Typical *Tel-O-Set* instrumentation for a centrifugal pump uses a combination of transmitter, recorder and controller for both suction and discharge pressure. Systems are interlocked through a relay to operate a Honeywell Series 800 control valve.

Transmitter

sends air signal to recorder. It's fast, accurate, compensated for changes in ambient temperature and pressure. Zero and span readily adjustable.

***Tel-O-Set* recorder**

is accurate, sensitive, compact. All adjustments made from front of panel. Complete chassis is replaceable . . . no loss of control. 30-day chart record.



***Tel-O-Set* controller**

has fast response, is unaffected by vibration. Disconnects and detaches from mounting at turn of a single switch. Each subassembly is a precalibrated unit, interchangeable in seconds.

FULL-TIME CONTROL

...For Pipeline Pumping Stations

Put a *Tel-O-Set* control system to work on your pumps—and you're sure of uninterrupted service. When instrument maintenance is needed, the job gets done in seconds.

The reason: transmitter, recorder and controller are designed with quickly interchangeable unit sections. You just snap in a new, precalibrated unit when needed.

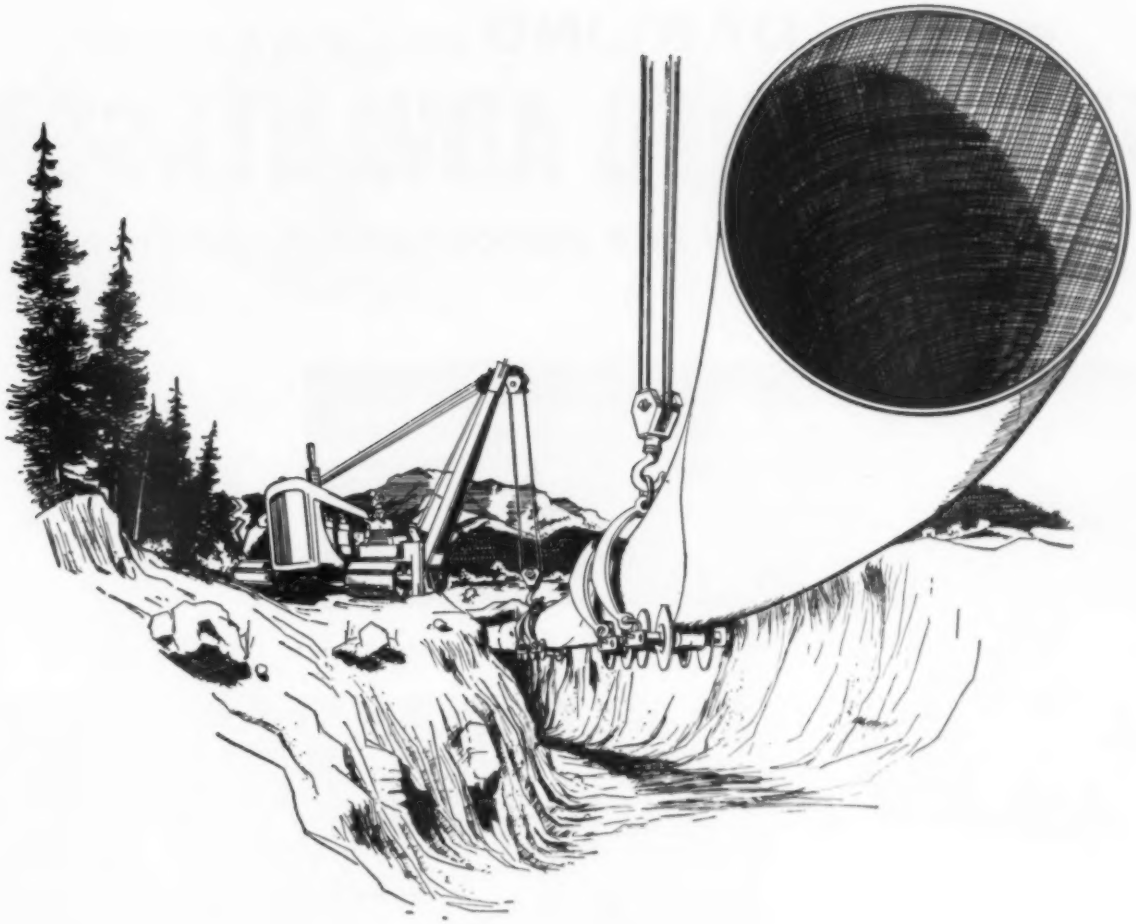
In performance, too, *Tel-O-Set* miniature instrumentation leads in every respect. It's accurate, sensitive, rugged. It's exceptionally easy to tune for peak operation.

Find out from your local Honeywell field engineer how *Tel-O-Set* instruments can be applied to your station. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Controls



How you can keep costs down with ARMCO LINE PIPE

Here's a typical example of the savings possible with Armco Welded Steel Pipe: 100 feet of Armco 12¾" x .188" wall pipe costs *about $7 less* than 100 feet of 10¾" standard weight pipe. Yet you get almost *50% more flow area,* and about *20% less weight.* Shipping and handling costs are lower.

You'll find that piping costs are lower when you choose the right diameter and wall thickness for each job from Armco's 132 different diameter-wall thickness combinations. Diameters range from 6 to 36 inches; wall thicknesses from 9/64- to ½-inch.

Write us for helpful information related to your line pipe problems. Armco Drainage & Metal Products, Inc., 5578 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

LOWER COST

MORE FLOW AREA

LIGHTER WEIGHT

ARMCO WELDED STEEL PIPE

ARMCO®

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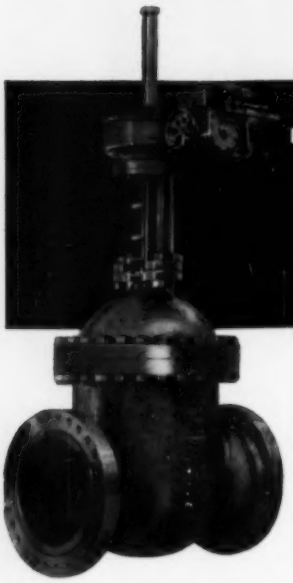
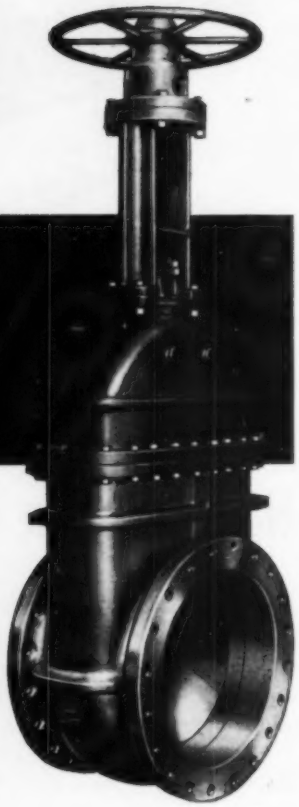
Check this DARLING gate valve trio for

UNMATCHED ADVANTAGES

in every oil, gas and petrochemical service



DARLING FULLY REVOLVING DOUBLE DISC GATE VALVES
—famous for *consistently* trouble-free operation in all kinds of service. Revolving disc principle assures easy operation, surer closure, minimum friction, automatic seating compensation, extreme life with minimum maintenance. Ask for Catalog 57.



DARLING ALUMINUM ALLOY GATE VALVES
—featuring all the advantages of the above revolving disc principle, *plus* new economies in the handling of "problem" fluids and gases or wherever aluminum piping is used. Ask for Bulletin SLS 5801.

DARLING-McEVOY SELF-SEALING CONDUIT VALVES
—the *only* conduit gate valve with *sealant gasketing* between gates and seats. Every closure leakproof! This and other advantages proved by outstanding performance on major lines. Get *all* the facts. Ask for Catalog 57.

Whatever the service, in any phase of pipelining, gathering or processing, these Darling gate valves offer worthwhile features and advantages unobtainable in other valves. The catalogs referred to above are available to give you the pertinent facts.

DARLING VALVE & MANUFACTURING CO.
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A plant built on the philosophy of "don't accept anything at face value"...

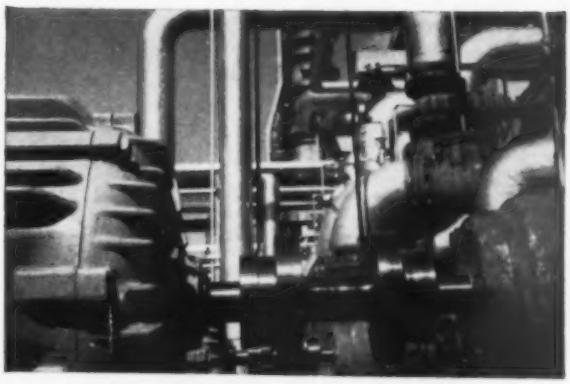
Tidewater's "Refinery of the Future" Uses 471 Fast's Couplings to Reduce Maintenance

IN PLANNING Tidewater's Delaware Refinery, all equipment purchases were examined from every angle . . . capital investment, manpower, maintenance and reliability. Fast's Self-Aligning Couplings were used throughout because they met Tidewater's exacting demands.

Tidewater's equipment design policies were established by survey teams that visited refineries all over the country. They carefully appraised each plant and asked operators what improvements they would make and what features they would retain if they were to redesign their drives.

In 471 applications at this refinery, Fast's Couplings guarantee mechanical flexibility that eliminates costly shutdowns and expensive shaft replacements. Fast's have the reputation of frequently outlasting the equipment they connect. This means savings in maintenance and down-time . . . in addition to protecting costly equipment against errors of alignment.

Nearly 40 years of coupling experience qualifies Koppers to solve *your* coupling problem. Write today for full details to: KOPPERS COMPANY, INC., Fast's Coupling Dept., 3207 Scott Street, Baltimore 3, Md.



Fast's Couplings give dependable, trouble-free service throughout Tidewater's entire production facilities.

This Fast's Coupling drives a pump delivering heavy naptha to the Solutizing plant.

Engineered Products Sold with *Service*

KOPPERS

THE ORIGINAL

FAST'S Couplings

Men like BOB NOLAN make the difference!

This double yoke is designed to "whip" pipe whip... it steadies the pipe and keeps it on an even keel. But it takes a skilled foreman like Bob Nolan to supervise its operation. Bob is one of the hundreds of Hill-Hubbell trained craftsmen who know how to "get the most out of a machine"! Because of the outstanding work of men like Bob Nolan, the Hill-Hubbell name is synonymous with quality in the pipe coating and wrapping industry! You need the precision, the dependability, and the quality of permanent factory application and factory-control.

Specify Hill-Hubbell wrapped pipe on your next job

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FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

DIVISION OF GENERAL PAINT CORP. • 3091 MAYFIELD ROAD, CLEVELAND 18, OHIO

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Power Availability

Availability of power for communications, computers, compressors, and valve actuators is often a major factor in the determination of the types and locations of automation equipment along a pipeline. Where there is no electric line service other power sources such as wet or dry batteries or fuel driven generators may be used. Field gas pressure may be used for the actuation of valves and compressor controls and usually provides satisfactory performance.

Control of the gas supply, which fluctuates in varying weather conditions, and the regulation of procurement from the most economical sources are functions of the computing equipment. The general computer automatically receives flow rate measurements from various critical points on the system and manual introduction of factors involving temperature forecasts, cost changes, contracts, and transmission characteristics.

The compressor station computing controller acts upon these data and may be set up to control the gas flow at the main line compressor station by setting flow rate at a prescribed time. In addition, the compressor station computer should transmit maximum and actual flow rates and emergency signals. These are sent to the nearest maintenance station to indicate equipment failure, shutdown, or required repair.

Main line compressor station computer controllers and substation computer controllers, where required, should transmit data and receive orders from the general pipeline computer.

Measurement Equipment

Pipeline measurements generally include temperatures, pressures, and rotary speeds. Sensing elements (transducers) are available, which depend on variable resistance, differential expansion, variable inductance, variable capacitance, vibration frequency, piezoelectric effect, and many other factors. In transducers the important features are freedom from drift, large signal range, durability, simple construction, and resistance to corrosion and temperature extremes.

Communications Equipment

An extensive pipeline data transmission service can be one of the more expensive items in the complete system. Careful analysis will indicate the most suitable and economical arrangement. Radio communication is the most economical for long distance point-to-point data transmission and will generally be on a microwave channel because of the difficulty of obtaining other frequency assignments.

When wire lines are used they may often be telephone, telegraph, or low speed control channels of utility companies, but here the installation problems might be serious. Wire cost is proportional to distance.

Reliable parts like transistors and magnetic amplifiers should be utilized in transmitting and receiving equipment and transmission should be made in the digital form. Noise screen-out should be accomplished by the use of check coding of all data, and information storage should be possible while the receiving equipment verifies valid reception.

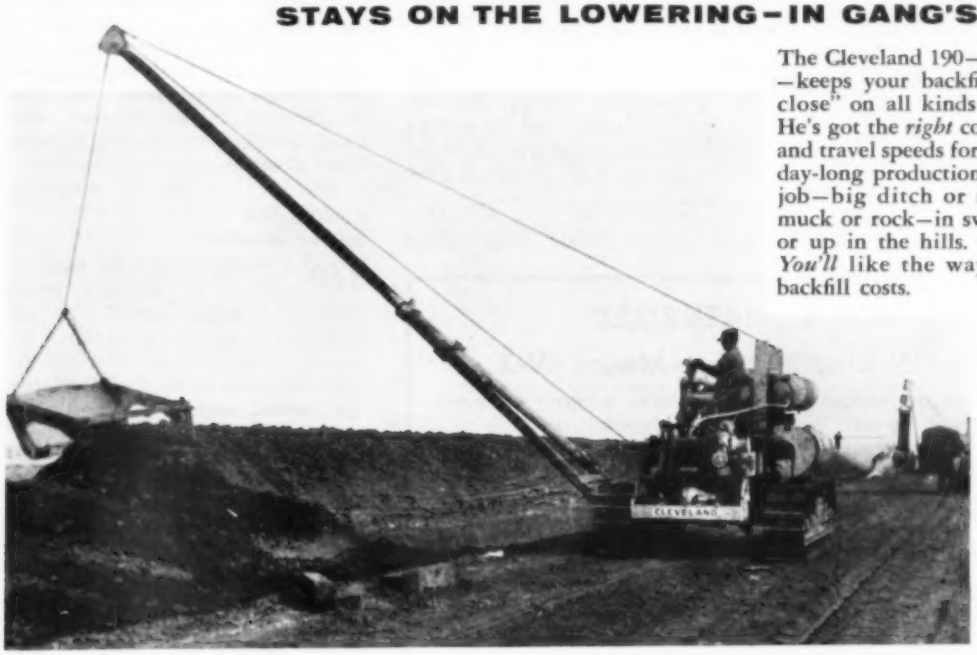
Expansion Toward Full Automation

As soon as it is evident that a fully automated pipeline system is anticipated complete plans should be prepared and studies should be made to determine the automatic functions desired, locations prescribed, and the

About the Author

Newton E. Armstrong *formerly was technical engineer and head of Manufacturing Operations Research of IBM in New York. He is now product manager, Control Division, Southwestern Industrial Electronics Company, one of the Dresser Industries, 2831 Post Oak Road, Houston 19, Texas.*

STAYS ON THE LOWERING—IN GANG'S HEELS



The Cleveland 190—*with just one man*—keeps your backfill operation "up close" on all kinds of pipeline jobs. He's got the *right* combination of line and travel speeds for continuous, high, day-long production on *every* backfill job—big ditch or small—dirt, sand, muck or rock—in swamps, on the flat or up in the hills. Operators like it. *You'll* like the way it lowers your backfill costs.

Good Everywhere

The CLEVELAND TRENCHER Co.

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dates of changeover. Manual equipment that is being purchased for replacement should be adaptable to eventual automation. This will include valves and compressors. The actuators for these components should have standardized signals and voltages. Flow controllers should use the actual flow rates instead of simple differential pressure. Reliable equipment, digital form transmission, and solid state (transistorized and magnetic amplifier) switching devices should be used to permit the high speed response required in full automation.

To further automation progress, automatic start sequencing, flow rate control, and trouble signaling of the compressor stations is effected with the addition of a sequence controller. It receives the starting information and controls each starting step in order. This unit will display the necessary trouble signals on a panel. By comparison of actual flow rate with a manually set flow rate it adjusts the flow rate automatically. An increased degree of automation is achieved when a telemetering unit is applied to the controller, reads the information stored in the controller on demand, and transmits it in coded form. This information may be transmitted only to the maintenance station for relay, or trouble information can be sent to the maintenance station and flow rate and maximum flow rate to the central office.

After all local measurements at compressor stations are used for automatic remote reset, and trouble signals are available to maintenance crews, the central office should have equipment for remote reset of all control variables. A general pipeline computer installation will then directly connect all telemetering terminals and take over system control.

With automatic information from all measurement points and the introduction of manual information on weather data, market changes, contracts, etc., the general pipeline computer will solve the required equations for complete automatic control of the system for efficient, safe, and economical gas transmission. * * *

Corrosion — Maintenance and Operation

Assembled Pipeline Closure

168 A new quick-opening closure for pipeline and station use is being produced by Sweco. The closure is in use on scraper traps, blowdowns, and meter runs. They are also designed for application on vessels, tanks, strainers, and filters where blind flanges or manways are required. The closure comes completely assembled and is attached to the line with only 1 field weld. The hinge is an integral part of the unit, and 1 man can easily open and close the door of the 32-in., 1000-psi model in 3 min.

The unit is designed so that the door cannot be opened without absolute pressure relief. The yoke acts as a safety cage until completely spread. The closure is manufactured in standard sizes through 32 in. Larger sizes are made on order. *Southwest Equipment Company.*

Three Protective Coatings Developed

169 The Protecto Wrap Company has added 3 new products to its line of protective coatings. No. 140 tape is a plasticized coal tar enamel containing polymerized synthetic resins and reinforced with a woven glass fabric. It may be used for any application technique requiring a prefabricated coating. No. 170 tape is the same material as No. 140 without the glass reinforcement and is able to conform to irregular surfaces. The rubber-like tape is self-healing, has high dielectric strength and provides a high quality coating. No. 160 mastic is a solvent release cold applied coating designed to form a heavy-bodied film in one application. It requires no stirring or primer and does not sag. The mastic is ideal for underground coating of steel pipe, tanks, and similar equipment. *Protecto Wrap Company.*

Continuous BS&W Monitor

170 A BS&W monitor has been developed by Foxboro which facilitates automatic operation of tank batteries by continuously measuring the percent water content in crude. Instrumentation consists of a BS&W sensing element connected to a dynalog recorder. The element is a flanged section of 2 or 4-in. pipe which is installed in the line to the measuring tank or to the pipeline. This element detects the dielectric changes caused by variations in water content.

The instrument can actuate an alarm or operate diversion valves to reroute off-specification oil at a present BS&W value. Measurements can be telemetered, if desired. Adjustable zero setting and automatic temperature compensator correct for different dielectrics of dry crudes and for temperature changes during monitoring. *The Foxboro Company.*

THE NEW MINIATURIZED

WILKINSON Line Locator Model W-2

This radically new, powerful transistorized sub-surface locating instrument weighs only four pounds and is one-fourth the size of conventional pipe locators.

It is as handy as a flashlight; the maintenance is trivial; the non-leak miniature batteries last ten times longer. Transistors never require replacement. Molded glass fibre cases. Transistor ear set. Telescope aluminum handle. Etches circuitry and unique antenna.

WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Drive, PASADENA 3, CALIFORNIA. SYlvan 0-4314

Self-Propelled Pipe Cleaning Machine

171 A new self-propelled, rotating-head pipe cleaning machine has been introduced by Remco Manufacturing Company. This machine enables 2 men to clean up to 9 times more pipe in 1 day than can be handled by hand cleaning and rocker type cleaners. It

eliminates the need for air compressors or electric generators.

Requiring only 6 in. of clearance under the line, the complete unit consists of a revolving head and a separate power plant which is mounted to the revolving head. The revolving head is adjustable to any required travel speed and uses standard cutters, knives or brushes. Forward travel and rotation of the cleaning head are completely independent. The machines are available in 10 models with each model capable of cleaning 3 successive sizes of pipe. Pipe sizes that can be handled by the machine range from 2 in. through 32 in. *Remco Manufacturing Company.*

Twin-Throat Venturi Tube

172 The Infilco twin-throat venturi, a new venturi which produces higher differential pressure or lower head loss in a shorter laying length than other types, is announced by Infilco Inc. The low pressure is taken from a hydraulically-streamlined body placed in the center of the narrowest cross-section, at a point at which the pressure is further lowered by locally increased velocities around it. A higher differential is obtained without materially changing the energy conversion in the tube, while the head loss remains practically the same. The twin-throat venturi tube is available in a full range of sizes. *Infilco Inc.*

VAPOR PHASE® PUTS ENGINE HEAT TO WORK, CUTS FUEL AND EQUIPMENT COSTS AT TIDEWATER'S VENTURA PLANT

Vapor Phase Units on each of eight gas engine compressors.

BEFORE VAPOR PHASE®

Power at the VLW Lease Gas Compressor Station consisted of eight Gas Engine Compressors of 2250 BHP total.

Engines were cooled by large radiators **with fans,** driven by separate multiple cylinder gas engines.

Gas-Fired Oil Heaters were used to separate water and sludge from crude oil.

Therefore Tidwater had the cost of additional engines and fuel to cool compressors, plus fuel cost to heat oil.

Crude Oil Treaters operated by 4000# steam per hour recovered by Vapor Phase from engine heat.

AFTER VAPOR PHASE® INSTALLATION

1. Engines are cooled by thermal circulation providing uniform temperature throughout the engine.
2. Separate gas engines to run radiator fans are eliminated.
3. Recovered heat from the engines produced 6750 pounds steam per hour which is fully utilized.
4. Gas-Fired boiler is eliminated.
5. 4,000 pounds of steam per hour heats the crude oil to separate water and sludge from oil.
6. Excess steam is used to heat the workmen's locker room and to drive a steam turbine for the standby condenser-engine cooler.
7. Engine maintenance is reduced.

Excess steam drives turbine for standby condenser.

E C VAPOR PHASE

ENGINEERING CONTROLS, Inc.

AN AFFILIATE OF ST. LOUIS SHIPBUILDING & STEEL CO.

611 E. Marceau
St. Louis 11, Mo.

1939 N. Hillhurst Ave.
Los Angeles 27, Calif.

FOR FURTHER INFORMATION ON ADVERTISED PRODUCTS, SEE READER SERVICE CARD

"Experience proves we can count on Nordberg Engines for low cost pipeline power for crude, products or natural gas"

These words are representative of the comments made by management and operating personnel of major pipeline companies in reference to the service they get with Nordberg engines for pipeline pumping and compressing service.

Hundreds of pipeline installations have proved that Nordberg Diesel, Duafuel® and Spark-Ignition Gas engines can be counted on to deliver efficient, low cost, long-term power for 'round-the-clock operations . . . on crude, products and natural gas pipelines.

"...and we depend on Nordberg Diesels to keep our tankers on schedule"

In Marine operations, too, Nordberg engines are the logical choice for reliable, low cost power . . . as evidenced by statements made by experienced tanker skippers, and other petroleum transportation personnel who have learned to depend on the "on-schedule" performance of Nordberg Diesels.

These powerful marine engines are widely used for both main propulsion and auxiliary service in tankers of all sizes, from small Great Lakes vessels, up through Coastal and Ocean-going tankers flying the flags of many companies and many nations.

Backed by this broad experience and proved performance, Nordberg engines are your best investment for low cost, long-term power . . . in sizes from 600 to over 11,000 horsepower. We will welcome your inquiry and the opportunity to discuss the application of Nordberg engines with you.

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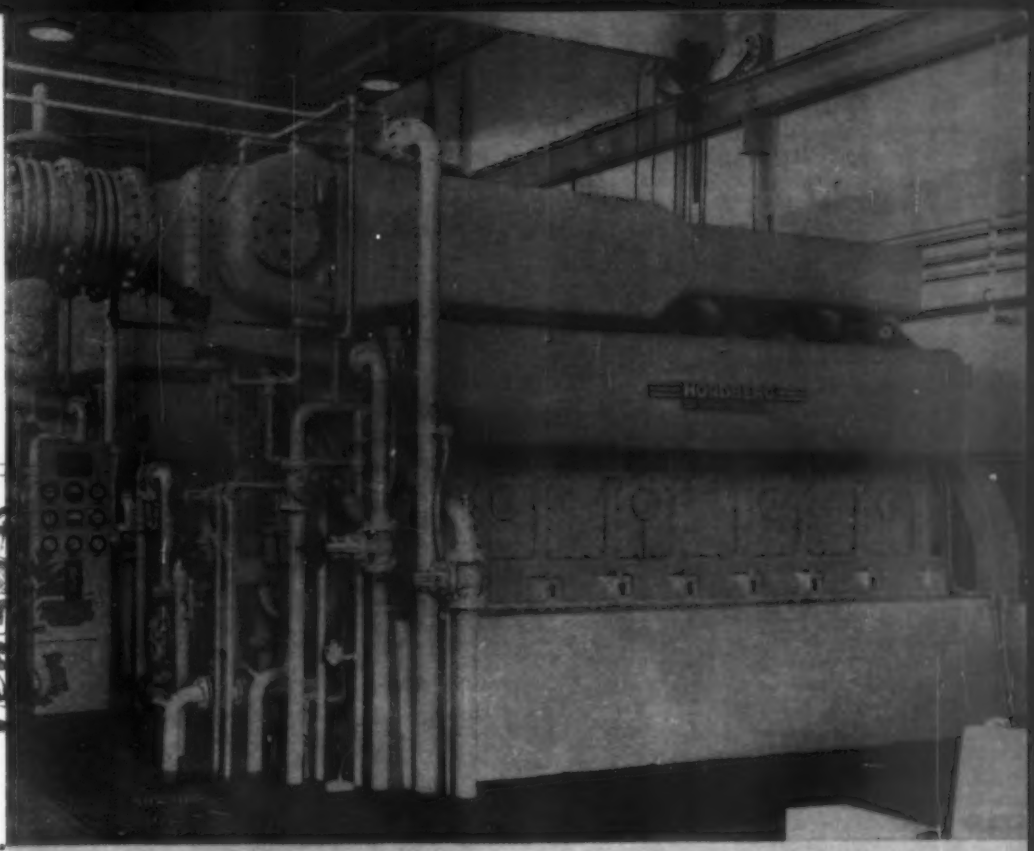
NORDBERG

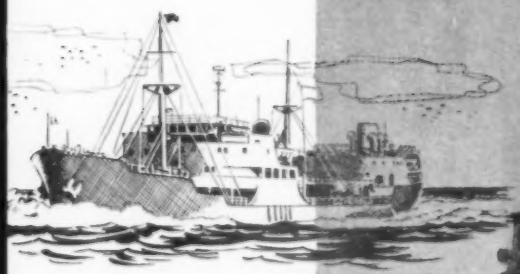
DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

O658

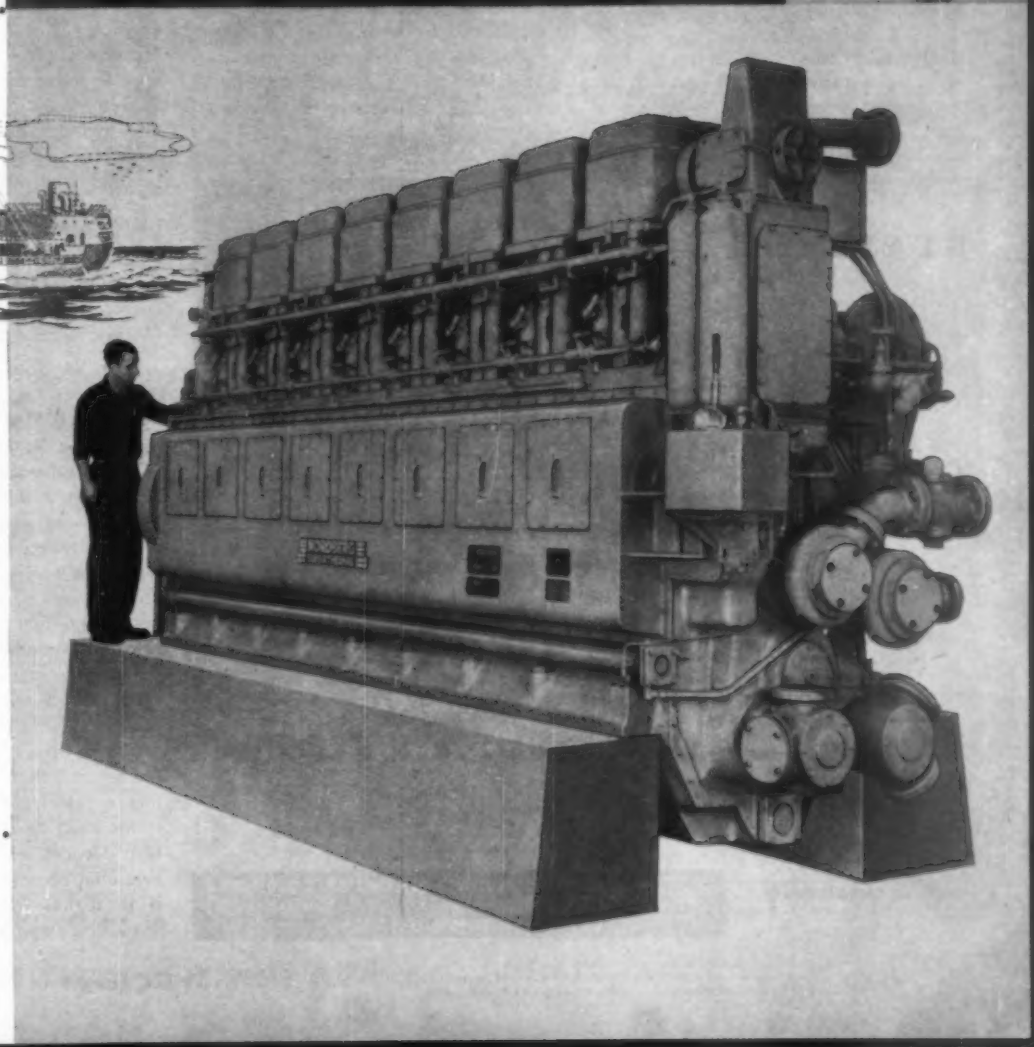
NORDBERG MFG. CO., Milwaukee, Wisconsin

These 2000 hp *Supairthermal*® pipeline engines have been in operation over 20,000 hours with extremely low maintenance. They are part of a total of 24 Nordberg engines to be installed along the Trans Mountain Pipe Line from Edmonton, Alta., to Vancouver, B.C.





Nordberg two and four-cycle In-line and V-type Diesel Marine Engines are being used in increasing numbers for dependable main propulsion of both new and repowered tankers serving numerous oil companies here and abroad. Four-cycle Diesels are built in sizes to 4500 hp, and two-cycle units in sizes to over 11,000 hp in a single engine.



Builders of America's Largest Line of Heavy Duty Engines

Bronze Gate Valves

173 A newly designed line of 200 psi bronze gate valves has been announced by Crane Company. Outstanding feature of the valves is the cylindrical body which provides considerably greater resistance to line distortion and internal pressure. Expanded-type, chromium steel alloy body seat rings can't loosen in service. Wear-resistant wedge disc is easily replaced. Valves are offered in both the rising stem and non-rising stem patterns in sizes ¼ through 3-in. *Crane Company.*

Pipe Coating for Corrosion Control

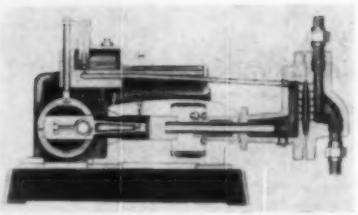
174 A new pipe coating has been developed by Copon Associates, Inc., in cooperation with a number of corrosion engineers. The coating, called Copon Arocoat, has been used successfully on submerged, buried, and exposed transmission lines. Large diameter pipelines can be coated and laid without special handling. Pipe can be coated, hauled, stacked, bent, and laid with little more care than with bare pipe.

Special equipment has been developed that makes possible spray application of the coating to bare pipe up to 15 mils dry film thickness in a single coat which dries within 30 min for stacking and stock piling. *Copon Associates, Inc.*

Diaphragm Chemical Pump

175 The new Milton Roy controlled volume diaphragm pump has a Teflon diaphragm which restricts metered chemicals to the corrosion-resistant liquid end and prevents leakage of chemicals. With each stroke, the plunger displaces hydraulic fluid and creates pumping action to meter chemicals through the suction and discharge valve cartridges in the liquid end. Double-ball checks in each valve assure repetitive metering accuracy better than plus or minus 1 percent. There is no mechanical connection between the plunger and diaphragm.

In simplex or duplex models (with



2 pump cylinders), diaphragm pumps have capacities to 69 gal per hr per cylinder against discharge pressures to 1000 psi. Capacities are adjustable from 0 to 100 percent of maximum. *Milton Roy Company.*

Communication — Instrumentation

Packaged Pipeline Control System

176 Union Switch & Signal has developed a pre-engineered and packaged centralized transport control system for use in pipeline applications. This system features such integrated security measures as a self-checking time code and protection against transmission of a code distorted by noise injection. Nine levels of security are built into the basic circuits to provide protection against interference by outside electrical disturbances. The system features a compact and simplified construction with all apparatus for supervising and controlling a small station and controlled remote location.

The system is capable of controlling pumps, compressors, turbines, diesel engines, valves and providing motor or pressure control set points. It can be used to telemeter data quantities from the remote station to the master station and includes a display of indicators and alarms on the control panel. It can be integrated into almost any existing control facility, or it may be adapted to suit the requirements of a particular control problem without necessitating the re-design of circuits and the mechanical arrangements of the system. *Union Switch & Signal.*

Remote Meter Reading System

177 The Varec pulse-code positive displacement meter telemetering equipment has sufficient data handling capacity and accuracy to indicate at a centralized point the meter readings from widely scattered points. The unit is accurate to one point in one million for a 6-digit unit. No vacuum tubes or other expendable parts are used.

Data are transmitted in code form similar to a telegraph message. The code is established by the transmitter which may receive its information from the meter either by mechanical coupling or electrical impulse. It is then transmitted to the receiver which in turn decodes and translates it to conventional numerical data and displays it in digital form. *Vapor Recovery Systems Company.*

STANDING ROOM ONLY!

but an H & M fits anywhere

Pat. Applied For

As the demand for pipe fabrication in all phases of industry increases, welding shops are busier than ever, and portable, adaptable equipment like H & M Pipe Cutting and Beveling Machines, is becoming more important every day. H & M machines—for pipe of 1½" to 36" in diameter—deliver speed, accuracy, durability and economy, even in the hands of inexperienced operators. Yet, they are easily moved from job to job, or shop to field, and can be stored away conveniently in their own specially-designed boxes.

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THE OUT-OF-ROUND MOTORIZED UNITS

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PIPE BEVELING MACHINE COMPANY
311 E. Third St. Diamond 3-0241
TULSA, OKLAHOMA

Microwave Equipment

178 New microwave RF equipment designed for duplex, multi-channel, point-to-point communications has been announced by Motorola. Operating in the 6000-7000 megacycle band, the equipment is able to utilize high gain, highly directional antennas of reasonable size, permitting reliable operation at conservative transmitter power output. The wide modulation on bandwidth of the MR-20 permits transmission of a practically unlimited number of channels of information.

Contributing to less outage time are hot stand-by models which enable the sensing of an equipment fault and switchover to a pre-heated stand-by unit in less than one second. The new equipment is provided in the common carrier 5925-6425 mc band, the operational fixed 6575-6875 mc band, and the government 7125-7650 mc band. *Motorola, Inc.*

Three-Valve Instrument Manifold

179 The new Anderson, Greenwood & Company 3-valve manifold is designed to provide a means of connecting all flow transmitters in an efficient and space-saving manner. Eccentrically tapped unions allow the manifold to be mounted directly on the orifice flanges regardless of plate thickness. Weighing only 7½ lb, the unit contains two ½-in. full-opening, rising stem plug valves and one ¼-in. by-pass or equalizer valve of similar design. This straight-through design allows rodding-through to the orifice taps on dirty or scaling services. Valve seats are replaceable inserts made from nylon or Kel-F. The cast steel body is self-supporting and by design has less than ½ the number of potential leak points of conventional piping manifold. *Anderson, Greenwood & Company.*

Pipeline Compressor Start Unit

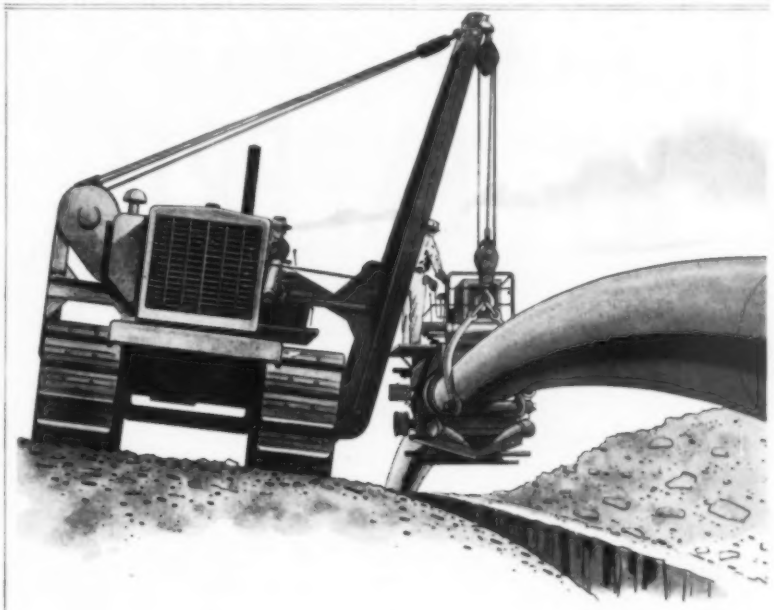
180 SIE's new compressor start unit (CSU-1) sequences all yard, compressor and auxiliary valves automatically. The unit will start a compressor on receipt of a single actuating signal, permitting semi-automatic operation of a compressor station from the control room. The CSU-1 displays instant indications of measurements and functions. Alarm operation and automatic shutdown occur when safe operating parameters are exceeded, or on failure of proper starting events.

A chrome-plated flow diagram, together with manual switches and valve position indicator lights for testing and valve indication, are installed on the face of the panel. Meters and trouble indication lights are provided for periodic station servicing. *Southwestern Industrial Electronics Company.*

Remote Supervisory Transmission System

181 A new system from Applied Science Corporation of Princeton provides up to 104 channels of control supervision, plus a maximum of 30 channels of continuous telemetry, over one transmission circuit. The system is designed specifically for application in the remote control and supervision of far-flung transmission, distribution and storage operations.

The ASCOP system can use any transmission circuit capable of passing 15 pulses per second. It therefore qualifies for transmission mediums from telegraph circuits to voice grade circuits and microwave and radio links. Heart of the system is coding and decoding circuits of telephone-type relays. Transmissions to both the master



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The majority of the men on Houston Contracting Company spreads—welders, cat drivers, truckers—are professional pipeliners, often with twenty to thirty years' experience. These men are YOUR guarantee of better-built pipelines.

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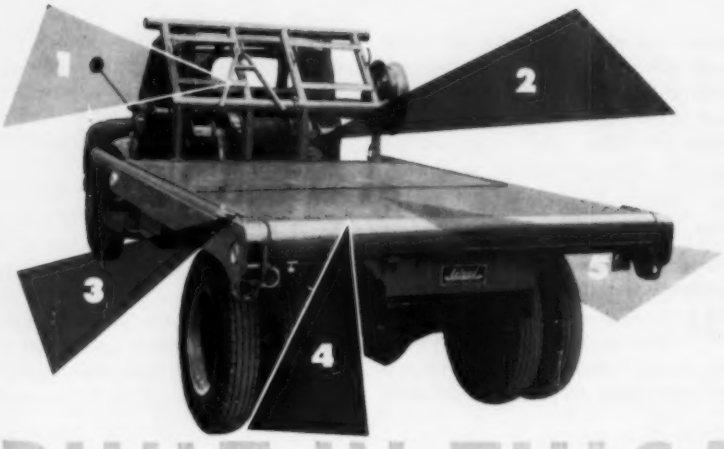


BUILT IN TULSA

LELAND'S "PACKAGED UNITS"

BY EXPERTS

Leland's famous "Packaged Unit" consistently outperforms other multiple purpose truck bodies in operating versatility, durable construction, dependability, minimum down-time, and economical operation.

Five "Packaged Unit" features that helped to attain this leadership:

1. **Headache Rack** — Heavy duty hydraulic tubing frame means absolute safety for the operator.

2. **Winch Mounting Brackets** — For strength, safety and adaptability to all winching jobs — with famous Tulsa Winches, if requested.

3. **Gin Pole Pocket Settings** — For double or single gin-pole use, bearing housings for rolling tailpipe, recessed in one-piece steel castings with gin poles.

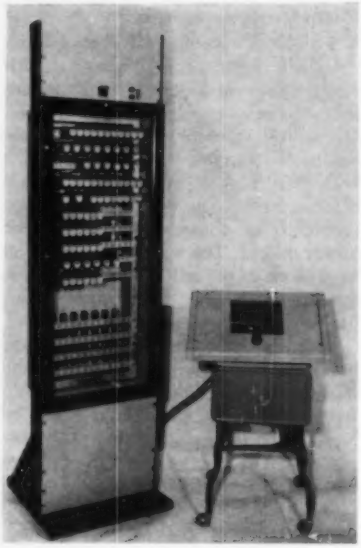
4. **Rolling Tail Pipe** — Seamless hydraulic tubing, mounted on shielded ball bearings, in special castings.

5. **Flush Mounted Body Deck Plate** — 2" hardwood flush mounted with steel-recessed snatchblock toggle, pole trailer bolster hole in tailboard.

For long term trucking economy — contact Leland for full details on their famous "Packaged Unit"

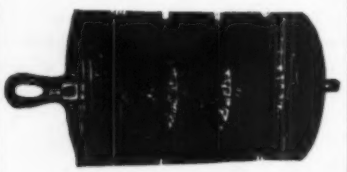
Leland also expertly handles parts and service on such famous name construction equipment as—Thew-Lorain—Gardner Denver—C-M-C—Blaw Knox—Cedarapids—Cleveland Trenchers and Tulsa Winches.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas



station and remote stations are accomplished by 14-bit signals that are subjected automatically to triple checks. If telemetering transmissions are briefly interrupted for supervisory control actions, continuous data output is accomplished by simple memory units. *Applied Science Corporation of Princeton.*

MOLE
Pipeline
Cleaner



for BETTER cleaning of
CRUDE LINES
PRODUCT LINES
NATURAL GAS LINES

FOR DETAILS WRITE

Pipeline Cleaners Co.
Fort Madison, Iowa

Other Equipment

Pipeline Tapping Machine

182 A new pipeline tapping machine, the Model 100-C, is announced by T. D. Williamson, Inc. The unit permits making hot taps through gate or plug valves into piping and tanks, installing scraper passage indicators, installing and removing instrument probes, etc., without shutdown.

The machine is a hand operated, high pressure, high temperature unit. Design features include a new gearing system which permits the boring bar to be rotated without travel and extended without rotation. Taps from ½ in. through 2 in. can be made on lines under pressures up to 1200 psi. Maximum boring bar travel is 18 in. and the machine weighs 44 lb. *T. D. Williamson, Inc.*

Anti-Friction Valve Control

183 The E-I-M anti-friction valve control is the latest in a series of valve controls manufactured by the company. The adaptation of the anti-friction screw to gate valves, in place of the conventional Acme screw and nut, and the adaptation of the anti-friction screw to 90-deg turn valves, has resulted in savings in input power.

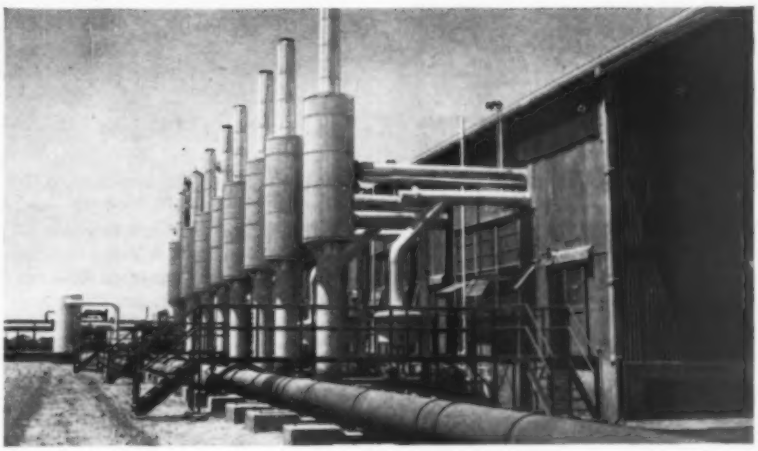
Motion between the nut and the screw is accomplished by rolling balls, eliminating sliding action which consumes energy in friction. When applied to gate valves, the life of a screw and nut is materially increased, reducing maintenance cost of the parts to a minimum. All gearing is eliminated from plug, butterfly and other valves of the quarter turn type. *E-I-M Company, Inc.*

High Tensile Strength Pipe Wrapper

184 High tensile strength for high speed application and low initial costs are characteristics claimed for Carey-Glass Outerwrap by the manufacturer, The Philip Carey Mfg. Company. Composed of reinforced glass mat saturated and coated with a long-life bitumen, the wrap is designed to protect pipeline coatings from mechanical damage during handling and lowering-in operations. Surface of this inorganic material is coated with a flake mica that reflects the heat of the sun, giving the enamel coating of the pipe a chance to cool and harden faster than with other materials.

The outerwrap has a tensile strength of over 25 lb per in. of width and can be used with either coal tar enamel or asphalt enamel or as a protective shield where tape coatings are applied. The product is available in roll sizes of 3-in. by 400 ft, 4 in. by 400 ft, and 4 in. by 800 ft. *The Philip Carey Mfg. Co.*

SILENCING
AT ITS BEST—WITH SOMETHING EXTRA



Many things affect the design and performance of silencing equipment. It takes experience to discern, classify and screen these influencing factors. The "extra" in every Maxim installation is this: it is based on an evaluation by specialists with unequalled experience in noise suppression.

Add to this basic advantage such other pluses as Maxim's tested and proven principles, the most extensive line of silencers, and consistent research and development — and you can see why Maxim silencers are preferred and more widely used throughout industry than any other make — and why you can specify Maxim with complete confidence.

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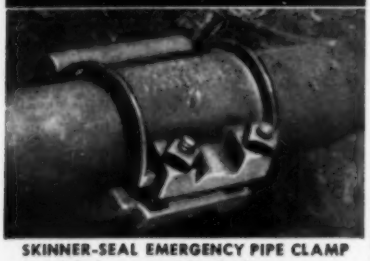
— QUICK, FINAL!
ANY PRESSURE—ANY TEMPERATURE



SKINNER-SEAL EMERGENCY PIPE CLAMP for pinhole or corrosion leaks.

SKINNER-SEAL PIPE LINE CLAMP for long splits and bad corrosion leaks.

In stock—all supply stores

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Ada, Michigan
SIGN OF SATISFACTION
TRANSMISSION LINES
DISTRIBUTION SYSTEMS

New Pipe-Laying Barge

185 The "L. E. Minor," a 4500-ton pipelaying barge complete with a traveling gantry crane, has been constructed by the Levingston Shipbuilding Company for Brown & Root, Inc. The vessel is equipped to drive piling and can raise and lower pipe over the side without additional aid. Pipe-handling equipment includes an automatic stalking device for moving the pipe across a rack and onto hydraulically operated line-up pads. An operator at a console can spin the pipe and raise and lower it as desired before welding the stringer bead. Other hydraulically operated roller pads along the work ramp are used to position the pipe to any degree of curvature desired as it rolls along the inclined ramps.

The barge measures 350 ft long, 60 ft wide, and 22½ ft deep. With the exception of material transportation and a stand-by tug for moving anchors by which the barge pulls itself forward, the vessel is self-sufficient. The gantry crane can travel 320 ft along the deck on tracks, and its 120-ft boom makes it possible to reach over the barge at any spot to handle any necessary lifting jobs. *Levingston Shipbuilding Company.*

Vertical Solid Shaft Motors

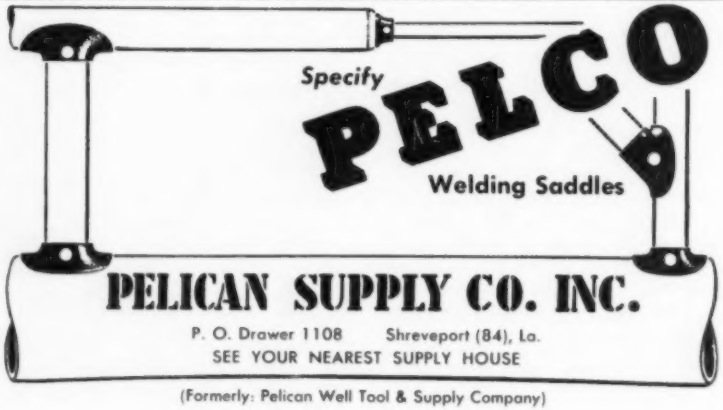
186 The Electric Motor Division of A. O. Smith is offering vertical solid shaft motors from 1 to 800 hp. Open drip-proof, totally enclosed, and explosion-proof models are offered in mountings to meet the old and current NEMA ratings.

Single phase models are offered in sizes ranging from 1 to 5 hp. and polyphase from 1 to 800 hp. Part-winding start models are available in 20 to 800 hp. Housed in heavy solid cast-iron frames, the line features normal and high-thrust capacities. *Electric Motor Division, A. O. Smith Corporation.*

Photographic Drawings Aid Pipeliners

187 The detail and accuracy of aerial photography have been adapted to pipeline surveying and mapping in a service by Aero Exploration Company, Inc. The new method enables a contractor to measure right-of-way to be cleared, to locate rivers and roads, and helps the company cut cost of surveying and drafting.

Key to the new alignment sheet is an acetate-base film which serves as the original tracing. Printed on its underside is a negative aerial photo of the land which the line crosses. The photos are usually scaled about 500 ft to the



(Formerly: Pelican Well Tool & Supply Company)

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FROG
IN OUR POND!

It's better to be a BIG frog in a little pond than a LITTLE frog in a big pond.

We have no *unimportant* customers, whose orders stand by while bigger accounts get service preference. Yet we're big enough to handle any job.

Do business where your business is important. For pipe, casing, pipeline supplies, pontoons, piling, field welding . . . call on KANE . . . and get "big frog" attention — every time.

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inch. Highways, railroads, rivers and streams are lettered in. The upper side of the film is treated to take draftsman's ink or pencil. There is only one drawing used from start to finish. Prints of the progressively revised drawing can be made at any time and the original film tracing becomes the final inventory alignment sheet. *Aero Exploration Company, Inc.*

Electronic Pipeline Locator

188 Wilkinson Products Company has announced a new design in electronic locators for determining location and depth of sub-surface installations such as pipes, cables, valves, boxes, and transmission lines. Miniaturization is achieved by the use of transistors, sub-miniature components, and etched circuitry.

The line locator is housed in a molded glass-fiber case which provides protection for heavy field use. A connecting handle of anodized aluminum, telescopic design, and a transistorized plastic ear set, weighing only 2 ounces, completes the set. *Wilkinson Products Company.*

Bellows Flow Meter

189 The new Honeywell bellows meter body a mercuryless unit which converts differential pressure changes into motion to operate an indicator, recorder, controller, or transmitter. Flow readings are square root or expanding scale; liquid level and differential pressure readings are linear.

Model 292D15 for flow and liquid level in open tanks is available in a wide variety of differential pressure ranges from 0-20 in. of water to 0-400 in. of water. Model 292D11 for liquid level in closed tanks under pressure or vacuum is available in ranges from 0-25 in. of water to 0-400 in. of water, with suppression up to approximately 650 in. of water for the 0-400 range. *Minneapolis-Honeywell Regulator Company.*

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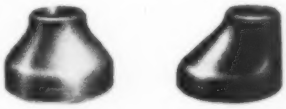
REDUCERS: Concentric and eccentric. Nominal pipe sizes 1" to 30", ASA B16.9, ASTM A234. Schedules 10 to 160, stainless steel, and other alloys. Special lengths and sizes.



SADDLES: Conventional, and for pressure vessel heads. Nozzle sizes from ¼" to 24". Fleet-Line saddles weld neatly into place in much less time, and with much less welding rod.

Complete encirclement saddles.

Fast interested service.
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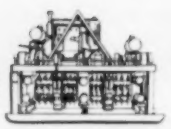
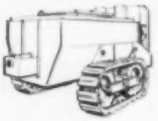

stationary cleaning & priming machine

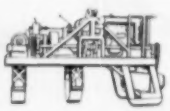
pipeline cradles

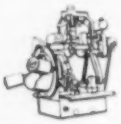
hydraulic internal line up clamp


pipeline kettles

ditch padder

internal line up clamp


road boring machine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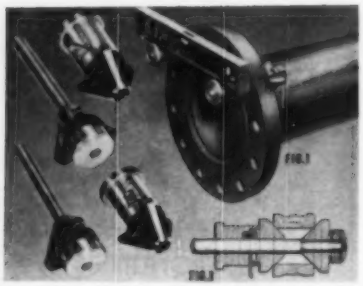


Flange Alignment Pins

190 New Mathey flange line-up pins used for cutting and welding jigs for pipeline and fabrication insure the alignment of bolt assemblies for accurate joining. The pins fit ¼-in. to 1¾-in. bolt holes. A pair of flange line-up pins are installed in the holes of the flange to support a spirit level so that the axis of the bolt holes in the flange are horizontal preparatory to welding the flange to a pipeline or piping fabrication. Cones of line-up pins automatically center the pin in any bolt hole and are designed to fit properly even on raised-face flanges. *C. A. Mathey Machine Works, Inc.*

Pipeline Pump Has Gas Turbine Drive

191 The first high-speed pipeline pump to use a combustion gas turbine drive for continuous, remote operation has been announced by Byron Jackson. Turbines are fueled by crude oil directly from the pipeline, and develop 5000 hp to drive the pumps at 5250 rpm.

The pump is a single-stage, double volute and double suction design. An unusually high head is developed for a single stage pump, with 1600 ft under normal operating conditions, and when operating near a closed valve at the overspeed trip setting of 5800 rpm, the developed head is 2600 ft.

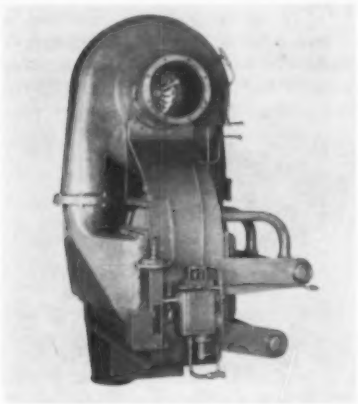
Weighing 4650 lb (only ⅞ lb per hp), this compact unit measures 5 ft 1 in. long, 4 ft wide and 4 ft high. A pump and mechanical seal combination allows up to 500 lb suction pressure on the start-up in addition to a high developed pressure. *Byron Jackson Pumps, Inc.*

Ultrasonic Degassing of Liquids

192 New ultrasonic continuous degassing equipment for application in liquid flow fields is announced. Stainless steel ultra-sonic equipment degasses liquids continuously when connected into a pipeline at rates up to 5 gal per min. Coating liquids, slurries, emulsions, water, oils, some plastics and many other liquids are handled. *General Ultrasonics Company.*

Turbocooler Provides Cool Combustion Air

193 Cooper-Bessemer has developed and introduced turbocooling, a method for supercooling combustion air which provides an important potential for increasing horsepower output of gas or gas-diesel engines. In



some cases these increases are as much as 23 percent with reductions as high as 5 percent in fuel consumption. Basically, the turbocooler is a turbine-driven centrifugal compressor equipped with an aftercooler.

The net effect of the turbocooler is to provide the engine with cool combustion air. The more air or oxygen that can be concentrated in the cylinders, the more efficient the combustion of the fuel and the more fuel the engine can take. As a result, engines have higher overload capacity with less danger of detonation and less Btu consumption per brake horsepower-hour. *The Cooper-Bessemer Corporation.*

Water-Cooled Welding Torch

194 Linde Company has announced a new Heliarc hand-welding torch, the HW-18. Cooling water passages are molded in the torch head, giving freedom from leakage. The torch body is made of Fiberglas-reinforced phenolic with exceptional heat resistance. New gas cups for the torch have improved thermal shock and heat resistance, with impact strength 4 times greater than usual ceramic cups.

The torch weighs 7 ounces. Improved design of collet bodies gives efficient argon shielding, thereby conserving gas. Optional shut-off valve on handle also conserves gas. *Linde Company.*

Pipeline Valve Control

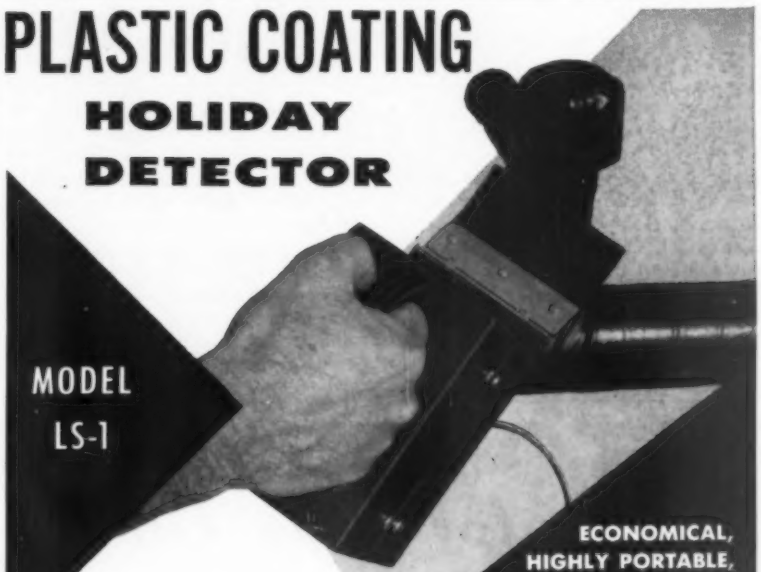
195 The Type RC valve control manufactured by E-I-M Company, Inc., provides control of plug valves of the quarter turn type or butterfly valves of quarter turn type. The units are rated from 35,000 to 3,000,000 in.-lb output torque. Ninety degree turn valves may be stroked through this travel in 2 to 3 seconds or longer. Time of closure may be varied through delivery of fluid to the cylinders. Units are sized to open or close the valve on a pressure equivalent to, but no less than the maximum operating differential pressure across the main line valve.

The RC units may be employed in open-close service from a station operable at the valve or from a remote point. Actuating control may be a pressure switch, flow device, or any other sensing element of pneumatic, hydraulic, or electric characteristics. *E-I-M Company, Inc.*

Continuous Duty Power Units

196 Waukesha Sales & Service Long-Life power units are designed to supply continuous duty power for long periods without servicing. Basic components of the units are standard Waukesha gas fuel, oilfield engines with large bearing areas; rigid crankcase-

PLASTIC COATING
HOLIDAY
DETECTOR



MODEL
LS-1

ECONOMICAL, HIGHLY PORTABLE, FIELD INSTRUMENT FOR USE IN TAPE COATING HOLIDAY DETECTION

DEPENDABLE, SAFE ON WRAPPINGS
This detector will locate pin-holes and bare spots in plastic tape applications such as polyethylene, etc.

EASILY PORTABLE
Hand-held instrument weighs but 3¾-lb. Easily inspects applications on field joints, service tees, valves and fittings. Not recommended for pipelines.

AUDIO SIGNAL
When the low energy spark locates a perforation through tape wrapping, spark sound is amplified by a speaker inside the unit. Unit has insulated plastic case and handle.

SILICONE-RUBBER ELECTRODES
Pliable silicone-rubber electrode 3½-in. wide can't injure wrappings yet conforms to surface contours, gives accurate check. Other width electrodes avail.

LS-1 DETECTOR COMPLETE CONSISTS OF:
Detector in plastic case with 6-volt, dry-cell battery. Electrode assembly with 3½-in. wide silicone-rubber blade. Ground wire cable 4-ft. long. Carrying case.

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cylinder blocks; balanced piston, rod, crankshaft, and flywheel components; special valve, head, and manifold design for gas fuel operation; and pressure lubrication and circulating coolant systems. An automatic oil levelizer and supply tank provide make-up lubricating oil as required. Oversize filters maintain condition of oil. Ignition efficiency is assured by a low-tension magneto system with individual special coils for each of the spark plugs. High water temperature and low oil pressure safety switches are provided. *Waukesha Sales & Service, Inc.*

Vibration Analyzer and Balancer

197 A new vibration analyzer and portable balancer incorporating the latest electronic technology to measure vibration, pinpoint the cause, and correct it, in-place, without dismantling the machinery, has been announced by the International Research and Development Corporation. The analyzer measures the vibration amplitude from 0.1 mil to 100 mils, the velocity from 0.03 to 30.0 in. per second, and the frequency from 450 to 150,000 cycles per min. A continuously variable filter is incorporated to permit a separate analysis of each frequency from 450 to 150,000 cpm. Other components include a velocity type vibration pickup and a stroboscopic lamp to study visually a rotating part.

Adding to the flexibility of this instrument is a scope jack provided to accommodate an oscilloscope to study visually the vibration waveform. A recorder jack is also incorporated to adapt a strip chart recorder. *International Research and Development Corporation.*

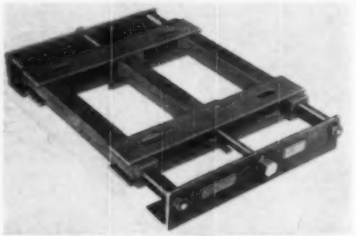
Explosion-Resisting Starter Enclosures

198 A new explosion-resisting motor starter enclosure for NEMA 7 and NEMA 9 service has been announced by Square D. The enclosures have threaded joints and are dust-tight and weather-proof. Cast from high-density aluminum alloy, the enclosures consist of a collar section, an upper tank and a lower tank. Two types of collar sections are available, one with a circuit breaker operating mechanism and one without.

Two sizes of tanks permit the assembly of a variety of starter types in a collar section of a given size. Collar sections have tapped and plugged holes for the installation of reset mechanism, pushbuttons and selector switches. Enclosures may be ordered as individual components for assembly into a complete starter, or may be ordered as a complete, factory assembled starter, with or without a main circuit breaker. *Square D Company.*

Motor Base Maintains Proper Belt Tension

199 Automatic Motor Base Company announces 2 new models of motor bases for maintaining proper amount of tension in belts. Sizes range from ¼ to 500 hp. Tension is effected by a spring which also compensates for

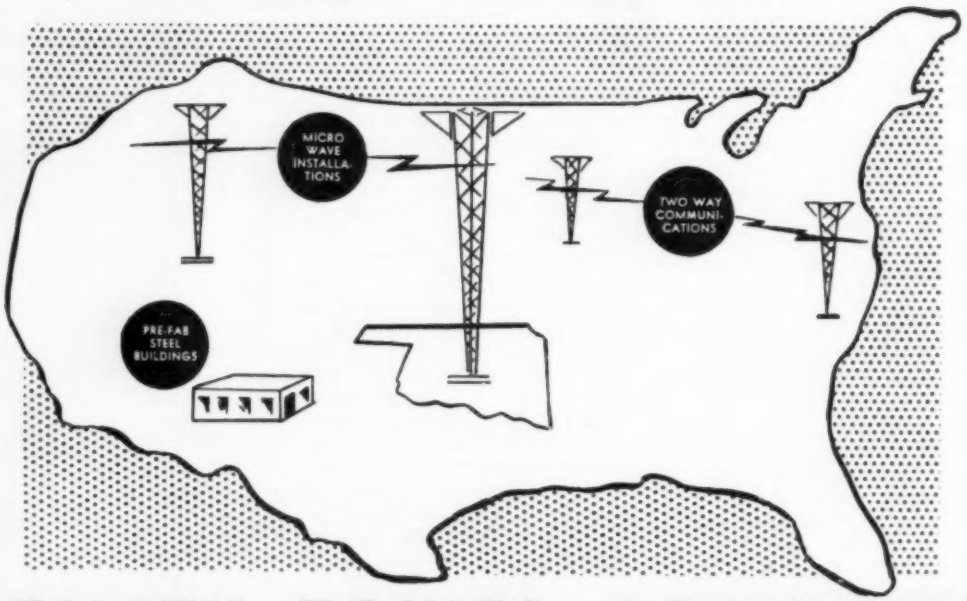


a considerable amount of belt stretch before any readjustment is necessary. When required, readjustment is made while operating under load merely by turning a screw.

Bases can be mounted in any position, and the direction of pulley rotation is immaterial. *Automatic Motor Base Co.*

"TOPS in TOWERS"

for Pipe Liners, too!



UTILITY TOWER COMPANY

P. O. BOX 7022 OKLAHOMA CITY, OKLAHOMA WI 35578, WI 34303

New Field for Contractors —Water Pipelines

R. L. Anderson,
Caterpillar Tractor Company

NOT MANY MONTHS AGO citizens of Dallas, Texas, were paying $1.25 for a five gallon jug of water. At the same time water supplies were so low in many Kansas communities that it was possible to maintain only a bare minimum supply for drinking and sanitary purposes.

These two occurrences are typical of what happens when a city doesn't have enough water reserves to last out a drouth period. To solve such problems, many cities are currently surveying their future water needs, both from a short range and a long range standpoint.

The answer that most dry cities find to their water problem lies not in drilling more wells in the same water table, but in finding new and greater sources of supply. In many instances the new source will be a major watershed area where the city can tap a lake for quantities large enough to meet the growing need for water. Often the new-found source of water lies many miles from where it is needed, and long distance pipeline transmission facilities are needed to transport the water.

In 1900, the nation was using 40 billion gallons of water per day. By 1950, we were using 200 billion gallons. In 1975, the demand will be for 450 billion gallons. Contrary to many opinions there is not a shortage of rainfall. But, there is a problem of distribution.

With ever-increasing demand for long distance water lines capable of transmitting large volumes of water a new type of pipeline construction opens to the enterprising oil and gas pipeline contractor. Long experienced in handling large diameter pipe over long distances, he appears to be the ideal contractor to do the job. Advanced methods of pipeline construction learned in the oilfields should go far to make him the most effective and competitive builder of water pipelines.

NEW

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PULSE CODE
. . . telemetering System
For the remote reading of
P. D. Meters

HIGH SYSTEM CAPACITY — 99 identification numbers and 6 digits of data (one million counts — Barrels, Gallons — etc.).

ACCURATE to one point in one million for a 6 digit unit.

HIGH INPUT RATE — 18,000 counts per hour (max.).

FAST READ OUT time — only 7 seconds required to obtain a reading.

SLOW PULSE RATE of 5 per second — Does not require high grade telemetering channel — All parts operate well within ratings.

DIGITAL OUTPUT of receiver unit suitable for data logging or other data handling functions.

TRUE DIGITAL Pulse Code type of transmission.

"ERROR CHECKING" TYPE of code practically eliminates the introduction of errors by telemetering channel abnormalities.

TRANSMISSION (read out) may take place during change in measurement (P.D. meter can be running). The transmitter does not have to be "locked", nor is the use of other methods necessary to prevent ambiguous readings.

SYSTEM AND EQUIPMENT not limited to telemetering of single type of measurement — transmitters/convertors available for liquid level, temperature, pressure, etc. System arrangements available as accessory features for remote control functions, data logging and alarm signals.

RELIABLE — no vacuum tubes or other expendable parts are used; all components are rugged and used well within applicable ratings.

Request Bulletin CP-3701

961-29

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The VAPOR RECOVERY SYSTEMS COMPANY
Compton, California, U.S.A.
Cable address: Varec Compton Calif (U.S.A.) All Codes

Hydraulic Valve Actuator

200 A rugged and compact gas or fluid operated actuator for operation of plug valves and other 90-degree rotating mechanisms, called the Robotarm Valve Actuator, has been developed by the Research Engineering Company. The new actuator incorporates a totally enclosed piston rack and gear assembly fully submerged in an oil bath. Other features include the fact that field installation to any standard wrench-operated valve can be made in a matter of minutes with the adjustable mounting bracket. Special adaptions to gear head valves also are available.

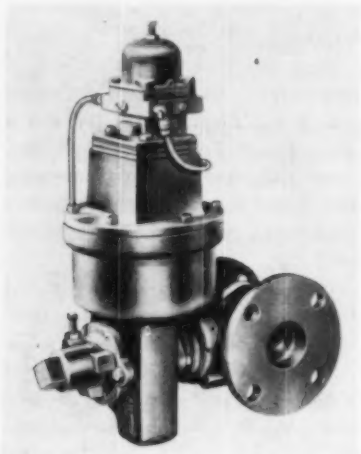
A square recess is provided in the bottom of the rotating gear shaft which facilitates the unit's being placed over and adapted to the average plug valve stem. This hollow shaft allows extension of the valve lubricating fitting. A square shank on top of the shaft enables the unit to be hand-wrench operated when desired. Adjustable stops are provided.

Standard parts furnished include the combination adjustable stops, valve stem adaptor bushings, and valve lubricator extension fitting. Accessories include component pneumatic or solenoid operated pilot valves and other items mounted at the factory for package unit assemblies. Special actuators can be furnished for higher torques, gear head valves, direct operation off high line pressures and electro-hydraulic operated units. Standard models generate torque output from 3000 in.-lb to 25,000 in.-lb with 100 psi operating pressure. *Research Engineering Company.*

Control Valve With Built-In Positioner

201 Control valves manufactured by DeZurik Corporation feature straight-through flow which minimizes turbulence and erosion. The valves have high Cv factors, 2 to 3 times the conventional, single-seated control valve.

The operator is totally enclosed with



a built-in positioner. The valve body has excellent control characteristics and are manufactured in sizes ½-in. through 20-in. *DeZurik Corporation.*

Non-Lubricated Plug Valve

202 Non-lubricated, corrosion-resistant features of the Texsteam-Graham plug valve insure trouble-free service in a wide range of field applications. The valve can be repaired in the line and is designed for the control of water, oil, gas, drilling fluids, or other fluids where full-flow, quick opening, (¼ turn) is required. Fabricated with screw, flange, Unibolt, Grayloc or stub connections and in sizes ranging from 1 through 4 in., the valves will effectively retain operating pressures scaled to 10,000 psi and temperatures ranging from -100 F to 750 F. Free floating, self-aligning seats contact the plug to create a positive, low friction seal. Standard valves are available in steel bodies with chromed or aluminum plugs. Special order units will be supplied in bronze, stainless steel, monel, cast iron, plastics, or custom material specified by the user. *Texsteam Corporation.*

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first choice for...

- Permanent Type Well Completions
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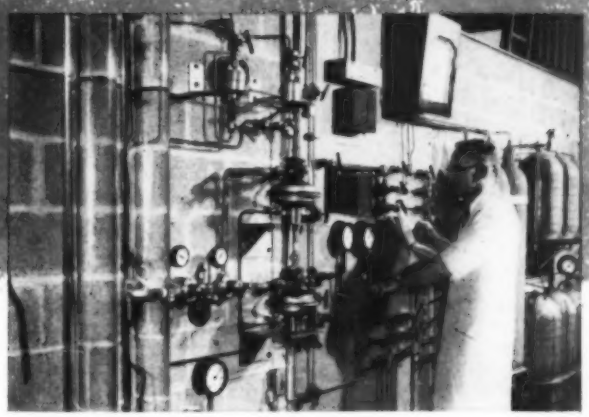
- Small Diameter Pipe



First choice because the Bearcat gives deep, deep penetration with minimum debris and no carrots to plug the perforations. Small enough to go through 2-inch pipe* . . . Flexible enough to go through crooked or bent tubing . . . Rigid enough to get past minor obstructions . . . Only P.T.W.C. perforators with published proof of performance—average Well Flow Index 1.13*.

*1-11/16 inch size

DOCUMENTED PERFORMANCE

Lane-Wells recently announced Flo Lab provides complete performance data including the Well Flow Index for the Bearcat and other perforators. Call Lane-Wells for this proof of superior performance in perforating service.

LANE-WELLS COMPANY

P. O. BOX 1664, HOUSTON 1, TEXAS

LEGAL LOAD PROBLEM WHIPPED with FRANKS *New* "ENDO" DERRICK

NOW!

★ **RIG CAN NOW BE MOVED IN EITHER ONE OR TWO PIECES WITH DERRICK STRUNG-UP**

★ **ALLOWS FOR GREATER POWER AND DRAWWORKS CAPACITY WITHIN LEGAL WEIGHT**

By W. B. Woody
Chief Development Engineer
Franks Division, Cabot Shops, Inc.

The most recent in a long list of original Franks developments for the oil industry is the drilling rig shown above. A variation of the field proven Comet 50 model for drilling to 5,000 feet, this new unit combines the advantages of dependability and power with the flexibility of a new type of derrick, the Franks ENDO derrick.

The new unit has a portable ENDO derrick with the unique facility allowing the operator to elect at each move whether the derrick is to remain a part of the unit or be carried separately. In either instance the derrick remains strung-up.

This facility is made possible by power handling of the structure through 180° of movement in combination with specialized hinging to give the clearances necessary.

The advantages of this facility are readily apparent. In difficult terrain, gross weight may be significantly reduced to permit easier handling and better flotation. Where highway movement is a problem because of legal restrictions, it will now be possible to move freely, with legal loads. Also, the unit may be made up of higher capacity components to better handle the work to be done, without reaching weight limits.

Removal of the ENDO derrick from the unit is accomplished in a matter of minutes. With it go the traveling block, hook, elevators and reserve line. In the removal operation, the derrick lowers itself onto a two-wheel pipe dolly with the crown end resting on a swiveling bolster on a light duty lease truck.

As an aid to separate transportation, means is provided for quickly anchoring the traveling block in the structure and attaching the carrying dolly. The 'fast line' is clamped at a spot provided on the structure and the few feet of line remaining on the drum is pulled off and stored near the derrick base. Pulling two pins and breaking one hydraulic hose completes the job of separating the derrick and unit.

The unit moves with the block completely strung-up — whether carried with the hoist or on the pole trailer. The operation of setting up over a location is still the same quick procedure used with other Franks units. With the new portable derrick, however, the hoist trailer is able to carry more power and line without exceeding highway limitations or field restrictions.

The new units may be ordered with the same wide variety of engines and other component parts as the standard Comet 50 models.

The concept employed in this new design will be applied to other members of the Franks well-servicing and work-over family, which includes the Rocket series, in the near future.

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FRANKS
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